Series 1959, No. 22 Issued May 1963

SOIL SURVEY

Northumberland and Lancaster Counties, Virginia

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
The Virginia Agricultural Experiment Station

HOW TO USE THE SOIL SURVEY REPORT

THIS SOIL SURVEY of Northumberland and Lancaster Counties will help farmers in planning the kind of management that will protect their soils and provide good yields; assist engineers in selecting sites for roads, buildings, ponds, and other structures; aid those interested in establishing or improving woodland; and will add to our general knowledge of soils.

In making this survey, soil scientists dug holes and examined surface soils and subsoils; measured slopes; and observed differences in growth of crops, weeds, and trees. They recorded everything about the soils that they believed might affect their suitability for farming, forestry, engineering, and related uses. The scientists plotted the boundaries of the different soils on aerial photographs. Then cartographers prepared from the photographs the detailed soil map in the back of this report. Fields, woods, roads, and many other landmarks can be seen on the map.

Locating the soils

You can use the index to map sheets to find the part of the soil map you wish to study. The index is a small map of Northumberland and Lancaster Counties that shows the location of each sheet of the large soil map. Boundaries of the soils are outlined on each sheet, and each kind of soil has a special symbol. All areas marked with the same symbol are the same kind of soil, wherever they appear on the map.

Suppose, for example, an area located on the map has a symbol SaA. The legend for the detailed map shows that this symbol identifies Sassafras fine sandy loam, nearly level. This soil and all the others mapped in the two counties are described in the section "Descriptions of the Soils."

Finding information

The soil report has special sections for different groups of readers. The section that describes the physiography and climate and gives a few statistics on agriculture will be of interest mainly to those not familiar with the two counties.

Farmers and those who work with farmers can learn about the soils from the sections "Descriptions of the Soils," "Use and Management of the Soils," and "Productivity Ratings of the Soils." In this way they first identify the soils on their farms and then learn how these soils can be managed and what yields can be expected. The soils are placed in capability units; that is groups of soils that need similar management and respond in about the same way. For example, in the section "Descriptions of the Soils," Sassafras fine sandy loam, nearly level, is shown to be in capability unit I-1. The management this soil needs will be described under the heading "Capability Unit I-1" in the section "Use and Management of the Soils."

The "Guide to Mapping Units and Capability Units" at the back of the report will facilitate use of the soil map and the report. This guide lists the soils mapped in the two counties, the page on which each soil is described, the capability unit in which each soil has been placed, and the page where that capability unit is described.

Foresters and others interested in management of woodlands can refer to the section "Use of Soils for Woodland." In this section the woodlands are described and some factors affecting their management are explained.

Engineers can refer to the section "Engineering Properties of the Soils." Tables in that section show the texture of soil layers, drainage, and other characteristics of the soils that affect engineering.

Readers interested in soil science can find information about how the soils were formed and how they were classified in the section "Formation and Classification of the Soils."

* * * * *

Northumberland and Lancaster Counties are in the Northern Neck Soil Conservation District. The district, through its officials, arranges for farmers to receive technical help from the Soil Conservation Service and other sources in planning good use and conservation of the soils on their farms. This soil survey was made cooperatively by the Virginia Agricultural Experiment Station and the Soil Conservation Service as part of the technical assistance to the Northern Neck Soil Conservation District, county agricultural agencies, and other agencies interested in land. Fieldwork on the soil survey was completed in 1959. Unless explained otherwise, all statements refer to conditions at the time of survey.

U.S. GOVERNMENT PRINTING OFFICE:1963

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.

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Series 1959, No. 22 Issued May 1963

SOIL SURVEY OF NORTHUMBERLAND AND LANCASTER COUNTIES, VIRGINIA

BY JOHN H. ELDER, JR., AND ELVIN F. HENRY, VIRGINIA AGRICULTURAL EXPERIMENT STATION, AND ROBERT F. PENDLETON, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE VIRGINIA AGRICULTURAL EXPERIMENT STATION

NORTHUMBERLAND AND LANCASTER COUNTIES are in the eastern part of Virginia and make up the eastern tip of the Northern Neck (fig. 1). This two-county area is bordered on the north by the Potomac River, on the east by the Chesapeake Bay, on the south by the Rappahannock River, and on the west by Richmond and Westmoreland Counties. The combined area of the two counties, according to U.S. Census of Agriculture for 1959, is 342 square miles. Northumberland County alone has an area of 200 square miles and Lancaster County, 142 square miles.

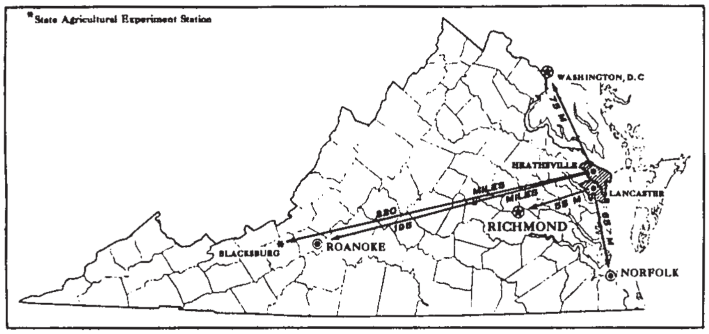

Figure 1.—Location of Northumberland and Lancaster Counties in Virginia.

Facts About Northumberland and Lancaster Counties

Northumberland County was originally part of an area called Chickacoan. The area was a large land grant to Lord Fairfax from the King of England. This grant, made in 1648, consisted of all the land between the Potomac and Rappahannock Rivers. The subdivision of this large area into counties started in 1652.

History and Development

Heathsville, the county seat of Northumberland County, had an estimated population of about 225 in 1960. Other towns in Northumberland County are Callao, Reedville, and Wicomico Church. Lancaster, the county seat of Lancaster County, had an estimated population of 100 in 1960. Other important towns in Lancaster County are Kilmarnock, Whitestone, Irvington, and Lively.

Marketing and traveling are accomplished mainly by motor transportation. Railroads are not in the area. Good State and Federal highways are in both counties. The principal outlets at present are two bridges spanning the Rappahannock River—one at Whitestone, the other at Tappahannock (in Essex County). Before they were built, transportation to Washington and Baltimore was chiefly by boat.

Northumberland and Lancaster Counties have many schools and churches. The high schools have been combined, and there is now one consolidated high school in each county. The one for Northumberland County is in Heathsville, and the one for Lancaster County, in Kilmarnock.

The small community post offices scattered throughout the area are being replaced by the rural delivery system of distributing mail. All parts of both counties are supplied with electricity and telephone service.

Physiography, Relief, and Drainage

Northumberland and Lancaster Counties are entirely in the Atlantic Coastal Plain physiographic province (*2*).[1] This province borders the Piedmont Province on the west and extends eastward to the Atlantic Ocean.

The two counties consist of geological terraces, which can be divided into the upland and the neckland, depending on surface features and elevation. These geological terraces have been classified as follows (*14*): Those forming the neckland are the Princess Anne, 0 to 15 feet above sea level; the Dismal Swamp (Pamlico), 10 to 25 feet above sea level; and the Chowan, 30 to 45 feet above sea level. Those forming the upland are the Wicomico, 60 to 90 feet above sea level; and the Sunderland, 100 to 200 feet above sea level.

Most of the area in these two counties is upland, which is a broad plain, sharply cut by streams. Most of the intensive farming is done on upland. Interstream areas are nearly level to gently sloping, with occasional stronger slopes on terrace edges and at the heads of drainageways. Drainage is well established in the upland.

The walls of gorges are generally steep, but are almost precipitous in places, and are suited only to forest. Along the drainageways is usually a narrow strip of poorly drained alluvial soil material, which is suited only to forest.

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[1] Italic numbers in parentheses refer to "Literature Cited," p. 50.

The neckland borders the Chesapeake Bay and the Potomac and Rappahannock Rivers and in places is as much as 50 feet above sea level. It consists of broad stretches of flat land with small gentle to steep slopes near the primary drainageways. Large areas of the neckland are wet because of a high water table. Primary drainage is through numerous tidal creeks and rivers; secondary drainage is not well established. Much of the neckland needs artificial drainage if the soil is to be cultivated.

All drainage in Northumberland County flows into the Potomac River and Chesapeake Bay. That in Lancaster County flows into the Rappahannock River and Chesapeake Bay. Other main streams are the Yeocomico, Coan, Little Wicomico, Great Wicomico, and Corrotoman Rivers. In addition, there are many small tidal creeks and rivers in the two counties. Numerous fresh-water streams flow through upland to feed tidal waters.

Climate [2]

Northumberland and Lancaster Counties are in the belt of prevailing west and southwest winds. They are also in the path of winter storms that cross this part of the United States, and they are affected by moist tropical air that blows in from the Atlantic Ocean or the Gulf of Mexico in the warm parts of the year. Temperature and precipitation typical in the two-county area are given in table 1.

The day to day weather is influenced mainly by mountains to the west and by adjoining bodies of water. The mountains affect temperature by diverting and modifying some of the cold winter storms that would otherwise cross this area. The average annual temperature is 56.4° F. July, generally the warmest month, has an average temperature of 76.7°. February, the coldest month, has an average of 36.8°. Temperature extremes are 106° for the highest temperature recorded and −23° for the lowest.

Rainfall is fairly well distributed throughout the year, but it varies considerably from year to year. It has ranged from an annual total of 26.82 inches in the driest year to 52.13 inches in the wettest. The average amount of moisture received is 41.63 inches per year. August is the wettest month and November, the driest. Summer is the wettest season; fall, the driest.

Snow can be expected any time from November to April. Slightly more than 3 inches of snow falls in each month during the period December, January, and February. The normal annual snowfall amounts to 13.6 inches. Abnormally heavy rains are associated with hurricanes or with storms that stagnate over the tidewater area of Virginia and that have drawn moist air from southerly latitudes.

Thundershowers account for a large part of the rain that falls in the warm season of the year. Flood damage is greatest during downpours and high tides.

Deficient rainfall in the summer and fall seriously damages crops about 1 year of 3 years. Drought seldom lasts long enough to affect all crops grown in a season. However, crops are short on moisture for 1 to 3 weeks in nearly every growing season.

TABLE 1.—*Temperature and precipitation at Warsaw Station, Richmond County, Virginia*

[Elevation, 140 feet]

Month	Temperature [1]			Precipitation [2]			
	Average	Absolute maximum	Absolute minimum	Average	Driest year (1941)	Wettest year (1945)	Average snowfall
	°F.	*°F.*	*°F.*	*Inches*	*Inches*	*Inches*	*Inches*
December	37. 9	75	−3	3. 09	3. 13	5. 67	3. 2
January	36. 9	82	−10	3. 06	2. 40	1. 59	3. 7
February	36. 8	75	−23	3. 28	1. 45	2. 32	3. 5
March	46. 1	94	7	3. 78	2. 92	. 84	2. 5
April	54. 7	97	14	3. 32	3. 40	2. 41	. 4
May	66. 0	99	29	3. 35	2. 73	4. 66	0
June	72. 7	103	38	4. 19	1. 70	3. 02	0
July	76. 7	106	47	4. 56	5. 13	20. 21	0
August	75. 5	102	45	4. 61	2. 63	. 92	0
September	68. 9	98	33	2. 76	. 02	5. 13	0
October	58. 2	100	24	3. 09	. 65	1. 24	0
November	47. 1	82	13	2. 54	. 66	4. 12	. 3
Year	56. 4	106	−23	41. 63	26. 82	52. 13	13. 6

[1] Average temperature based on a 43-year record, through 1955; highest and lowest temperatures based on a 41-year record, through 1952.

[2] Average precipitation based on a 46-year record, through 1955; wettest and driest years based on a 46-year record, in the period 1893–1955; snowfall based on a 40-year record, through 1952.

Figure 2 shows the average rainfall in relation to the potential evapo-transpiration,[3] by months, in Northumberland and Lancaster Counties. Evaporation and transpiration exceed rainfall from May through September. In these months supplemental irrigation can be used to obtain maximum growth of crops. In the other months of the year, rainfall exceeds evapo-transpiration and recharges the dry soil with moisture. If the soil contains all the moisture it can hold, or is at field capacity, when the growing season begins, crops obtain enough moisture until the middle of May, even though rainfall is less than potential evaporation and transpiration. Crops are most likely to be short on moisture in June, July, August, and September.

The frost-free period averages 194 days but ranges from 156 to 221 days. The average date of the last frost in spring is April 15, and that of the first frost in fall is October 25. Near open water, the average date of the last frost in spring is earlier, and the first in fall is later. The last frost in spring has occurred as early as March 21 and as late as May 11. The first frost in fall has occurred as early as October 1 and as late as November 14. Because of the variability in beginning and end of the frost-free period, tender crops can be seriously damaged if planted too early or too late.

The reaction of crops in various stages of growth to varying degrees of freezing temperatures is summarized as follows.

Light freeze (28 to 32° F.): There is little or no damage to most plants. Tomatoes, peppers, and other tender

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[2] By KENNETH A. RICE, meteorologist, Airport Station, Byrd Field, Sandston, Va., and GLENN V. WILSON, SCS.

[3] Adapted from the work of: BLANEY, H. F., and CRIDDLE, W. D. DETERMINING WATER REQUIREMENTS IN IRRIGATED AREAS FROM CLIMATOLOGICAL DATA. SCS-TP-96. 1950. Slightly revised, 1952.

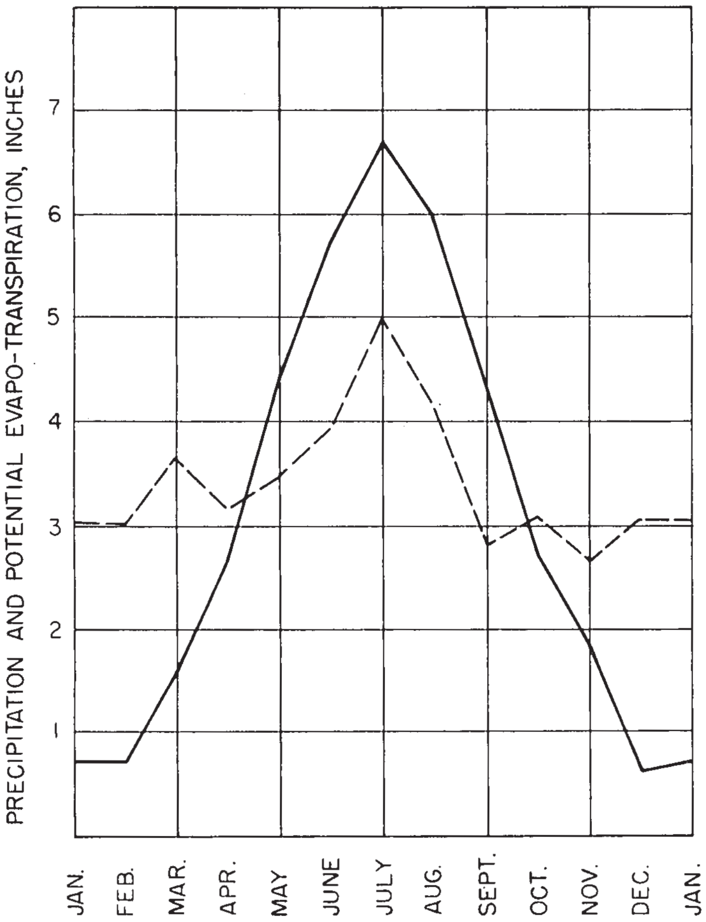

***Figure 2*.—Rainfall (broken line) and potential evapo-transpiration (solid line) in Northumberland and Lancaster Counties, Va.**

plants may be destroyed. Plants hardened by drought or by a combination of low temperature and sunny days may escape damage. The anthers of small grains and the anthers and pistils of strawberries and of some of the flowering crops may be destroyed, thereby reducing yields with little or no damage to the plants.

Moderate freeze (*24 to 28° F.*): There is some damage to most plants. Fruit blossoms and semihardy plants are heavily damaged. Tender plants may be destroyed.

Severe freeze (*Less than 24° F.*): All plants subject to freezing are severely damaged.

Water Supply

Wells supply nearly all the domestic water in Northumberland and Lancaster Counties. Many unimproved seepage springs are used as a source of water for livestock.

Water wells in the area are of three types: (A) Dug wells, ranging in depth from 8 to 60 feet, supply a large part of the population. The yield and quality of water from these wells vary considerably. At low elevations some wells yield brackish water when pumped heavily. (B) Drilled wells, ranging in depth from 300 to 900 feet, tap artesian water. In some of these wells, water rises to about 35 feet above sea level (*5*). Artesian wells drilled at low elevations flow freely. Almost all the water used by industry comes from deep drilled wells. Small water companies obtain water from deep wells to supply most of the villages. Deep drilled wells are in demand by farmers and homeowners because of the good supply and usually good quality of water that can be obtained from them. (C) Driven wells are least important as sources of water. This type of well ranges in depth from 10 to 20 feet, is found mainly at lower elevations, and generally yields low quality or brackish water.

Industries

The economy of Northumberland and Lancaster Counties is based on farming, fishing, oystering, and crabbing. Several fish-oil factories are near the Chesapeake Bay. Reedville, in Northumberland County, has one of the largest menhaden fish-oil plants in the country. Oysterhouses, food-fish canneries, and crab processing plants are along the Rappahannock and Potomac Rivers and Chesapeake Bay and the tributaries of these waters. These processing plants provide off-season jobs for many part-time farmers.

Lumbering and the cutting of pulpwood are also large industries. A paper company owns several thousand acres of woodland and is constantly improving the forest and the production of pulpwood. Several tomato canneries and tomato auction sheds are also in these counties. They provide jobs, as well as a market for locally grown tomatoes.

Agriculture

According to the 1959 U.S. Census of Agriculture, Northumberland County had 488 farms, or 49.0 percent of its land in farms; Lancaster, 253 farms, or 29.4 percent of its land in farms. The average size of farm in Northumberland County was 128.5 acres; that in Lancaster County, 105.7 acres. Table 2 shows how land was used in these two counties.

TABLE 2.—*The use of land in farms in 1959 in Northumberland and Lancaster Counties*

Land use	Northumberland County	Lancaster County
	Acres	*Acres*
Cropland harvested	30, 325	14, 748
Cropland used only for pasture	1, 838	684
Cropland not harvested and not pastured	1, 374	389
Woodland pastured	2, 009	279
Woodland not pastured	24, 878	8, 657
Other pasture (not cropland and not woodland)	436	951
Other land (houselots, roads, wasteland, etc.)	1, 862	1, 022

The main crops are corn, soybeans, wheat, oats, barley, and tomatoes. Most of the farmers grow grain, which is sold for cash. The soil and climate are well suited to these crops, and yields are generally above the State average. Corn is grown nearly everywhere, and only a small part

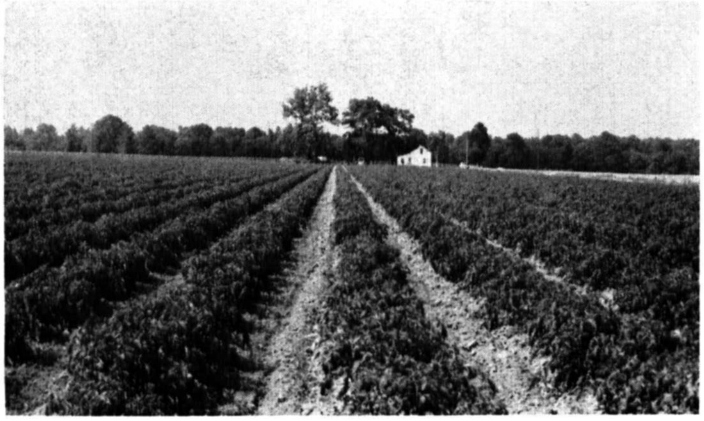

***Figure 3.*—Tomatoes, an important cash crop, growing on Woodstown fine sandy loam.**

of it is fed on the farm. Corn, soybeans, and small grains are sold to local elevators, who in turn sell to markets outside the county. Tomatoes, grown mainly for canning and for sale as green wraps, are an important crop (fig. 3). The green wraps are sold through local auctions, mostly to the large retail and wholesale buyers. Ripe tomatoes are processed by local canneries. At one time, red clover was an important crop, but since grain prices are high, little land is now in clover. Many farmers practice an exacting rotation of corn and soybeans, with heavy fertilization, but without an intervening sod crop.

A few commercial peach and apple orchards are on the well-drained soils. Yields of fruit are high when frost does not damage the crop.

The acreages of the main crops and numbers of peach trees in 1959 in Northumberland and Lancaster Counties are shown in table 3.

TABLE 3.—*Acreages of principal crops and numbers of peach trees on farms in 1959 in Northumberland and Lancaster Counties*

Crop	Northumberland County	Lancaster County
	Acres	*Acres*
Corn for all purposes	11, 577	4, 773
Wheat threshed or combined	4, 251	1, 380
Oats threshed or combined	1, 201	429
Barley threshed or combined	822	630
Rye threshed or combined	129	87
Soybeans grown for all purposes	26, 937	13, 217
Land from which hay was cut	1, 731	941
Vegetables harvested for sale	579	318
	Number	*Number*
Peach trees of bearing age	3, 905	5, 304

Livestock in the area is mainly hogs. There are a few horses and mules and a few herds of dairy and beef cattle. A few large poultry farms are also in the area, and most farmers have small flocks of chickens.

Livestock and poultry on farms in 1959 are shown in table 4.

TABLE 4.—*Livestock on farms in 1959 in Northumberland and Lancaster Counties*

Livestock	Northumberland County	Lancaster County
	Number	*Number*
Cattle and calves	1, 624	1, 396
Horses and mules	147	98
Hogs and pigs	7, 067	2, 994
Sheep and lambs	353	322
Chickens, 4 months old and over, on hand	26, 992	28, 479

Descriptions of the Soils

The soil scientists who made this survey went over the area at appropriate intervals and examined the soils by digging with a spade or by using an auger. They examined the different layers, or horizons, in each boring, and they compared the different borings. By such comparisons, they determined the different kinds of soils in the area. Then, they described the various soils and drew boundaries on aerial photographs to separate them.

The soils of Northumberland and Lancaster Counties are described in the following pages. Their acreage and proportionate extent are shown in table 5, and their location can be seen on the detailed photomap at the end of the report.

Following the name and range of slope of each soil, there is a set of symbols in parentheses. These identify the soil on the detailed map. The capability grouping is given for each soil. The capability units are described in the section "Use and Management of the Soils."

In describing the soils, the scientist frequently assigns a letter symbol, for example "A_1," to the various layers. These letter symbols have special meanings that concern scientists and others who desire to make a special study of soils. Most readers will need to remember only that all letter symbols beginning with "A" are surface soil; those beginning with "B" are subsoil; and those beginning with "C" are substratum, or parent material.

The boundaries between horizons are described so as to indicate their thickness and shape. The terms for thickness are (1) *abrupt*, if less than 1 inch thick; (2) *clear*, if about 1 to 2½ inches thick; (3) *gradual*, if 2½ to 5 inches thick; and (4) *diffuse*, if more than 5 inches thick. The shape of the boundary is described as *smooth*, *wavy*, *irregular*, or *broken*.

The color of a soil can be described in words, such as "yellowish-brown," or can be indicated by symbols for the hue, value, and chroma, such as (10YR 5/4). These symbols, called Munsell color notations, are used by soil scientists to evaluate soil colors precisely. For the profiles described in this report, color names and color symbols are given for moist soil.

The texture of the soil refers to the content of sand, silt, and clay. It is determined by the way the soil feels when rubbed between the fingers, and it is checked by laboratory analyses. Each soil is identified by a textural name, such as "fine sandy loam." This refers to the texture of the surface layer, or A horizon.

TABLE 5.—*Approximate acreage and proportionate extent of soils*

Soil	Northumberland County		Lancaster County	
	Area	Extent	Area	Extent
	Acres	*Percent*	*Acres*	*Percent*
Beltsville very fine sandy loam, nearly level	1,012	0.8	534	0.6
Beltsville very fine sandy loam, gently sloping	65	.1	14	(1)
Beltsville very fine sandy loam, gently sloping, eroded	660	.5	368	.4
Bertie silt loam	3,965	3.1	1,960	2.2
Bladen silt loam	193	.2	(2)	(1)
Caroline clay loam, sloping, severely eroded	109	.1	46	(1)
Caroline clay loam, strongly sloping, severely eroded	35	(1)	147	.2
Caroline very fine sandy loam, gently sloping, eroded	36	(1)	438	.5
Caroline very fine sandy loam, sloping, eroded	217	.2	145	.2
Coastal beach	555	.4	372	.4
Craven clay loam, strongly sloping, severely eroded	165	.1	158	.2
Craven silt loam, nearly level	381	.3	278	.3
Craven silt loam, gently sloping, eroded	85	.1	431	.5
Craven silt loam, sloping, eroded	141	.1	11	(1)
Dragston fine sandy loam	2,444	1.9	2,865	3.2
Elkton silt loam	200	.2	8	(1)
Fallsington fine sandy loam	1,816	1.4	1,755	1.9
Kempsville fine sandy loam, nearly level	1,791	1.4	2,674	2.9
Kempsville fine sandy loam, gently sloping	1,323	1.0	2,670	2.9
Kempsville fine sandy loam, gently sloping, eroded	286	.2	638	.7
Kempsville fine sandy loam, sloping, eroded	182	.1	104	.1
Kempsville fine sandy loam, sloping, severely eroded	66	.1	83	.1
Lakeland loamy fine sand, gently sloping	209	.2	577	.6
Lenoir silt loam	230	.2	20	(1)
Local alluvial land	149	.1	155	.2
Matapeake silt loam, nearly level	7,587	5.9	708	.8
Matapeake silt loam, gently sloping	22	(1)	3	(1)
Matapeake silt loam, sloping, eroded	866	0.7	134	0.1
Matapeake silt loam, gently sloping, eroded	183	.1	14	(1)
Matapeake silt loam, strongly sloping, eroded	129	.1	(2)	(2)
Mattapex silt loam	5,573	4.4	3,174	3.5
Mixed alluvial land	5,012	3.9	3,939	4.3
Othello silt loam	7,188	5.6	2,446	2.7
Rumford loamy sand, thick surface, gently sloping	4	(1)	170	.2
Rumford loamy sand, gently sloping	594	.5	144	.2
Rumford loamy sand, sloping, eroded	244	.2	45	(1)
Sassafras fine sandy loam, nearly level	12,841	10.0	4,620	5.1
Sassafras fine sandy loam, gently sloping	23,420	18.3	14,706	16.2
Sassafras fine sandy loam, gently sloping, eroded	1,520	1.2	788	.9
Sassafras fine sandy loam, sloping, eroded	2,978	2.3	772	.8
Sassafras fine sandy loam, sloping, severely eroded	1,202	.9	439	.5
Sassafras fine sandy loam, strongly sloping, eroded	472	.4	61	.1
Sassafras fine sandy loam, strongly sloping, severely eroded	268	.2	86	.1
Sassafras loamy fine sand, thick surface, nearly level	403	.3	5,921	6.5
Sassafras loamy fine sand, thick surface, gently sloping	193	.2	3,905	4.3
Sloping sandy land	7,374	5.8	8,372	9.2
Steep sandy land	26,274	20.5	16,536	18.2
Tidal marsh, high	120	.1	95	.1
Tidal marsh, low	2,196	1.7	1,740	1.9
Woodstown fine sandy loam	4,863	3.8	5,507	6.1
Made land	141	.1	60	.1
Mines and pits	18	(1)	44	(1)
Total land area	128,000	100.0	90,880	100.0
Water	14,720	-------	7,040	-------
Grand total	142,720	-------	97,920	-------

[1] Less than 0.1 percent.

[2] Absence of data indicates soil not mapped in county.

Structure is the way the individual soil particles are arranged in larger grains, or aggregates; the arrangement affects the amount of pore space between the grains. The structure of the soil is determined by the strength or grade, the size, and the shape of the aggregates. For example, the soil material in a horizon may have "weak, fine, blocky structure."

Soil drainage is expressed in relative terms that indicate how rapidly water moves off the surface of a soil or percolates through a soil. A well-drained soil commonly retains optimum amounts of moisture for plant growth after rains or after additions of irrigation water. Also, roots can grow deeply in a well-drained soil. A poorly drained soil is wet most of the time; the water table is at or near the surface during a considerable part of the year. The large quantities of water that remain on and in poorly drained soils prohibit the growing of field crops under natural conditions in most years. Only moisture-tolerant plants can grow on poorly drained soils.

Degree of drainage is indicated by mottling. The well-drained soils have brown, yellow, and red colors throughout their profiles. Moderately well drained and somewhat poorly drained soils are largely brown, yellow, and grayish brown in the upper horizons but are mottled with gray, yellow, and brown in their lower horizons. Poorly drained soils are dominantly gray throughout and are mottled with brown and yellow.

Well drained and moderately well drained soils are best suited to agriculture. The soils on the upland are generally well drained; many of those on the neckland are poorly drained or somewhat poorly drained and require artificial drainage for good yields of crops.

Beltsville very fine sandy loam, nearly level (0 to 2 percent slopes) (BeA).—This moderately well drained soil is, mainly on high Coastal Plain terraces consisting of marine sand, silt, and clay. It is associated with the Sassafras and Kempsville soils, and to some extent with the Caroline soils. It differs from them in having a strongly developed fragipan at a depth of about 24 inches and in being less well drained. Beltsville very fine sandy loam, nearly level, is finer textured throughout the profile than the Sassafras and Kempsville soils, and it is yellower than the Sassafras. The underlying material, or C horizon, of Beltsville very fine sandy loam, nearly level, is 30 to 48 inches below the surface, is finer textured than that of the Sassafras soils, and commonly resembles that of the Caroline. The native vegetation was mainly hardwoods.

Profile in cultivated area (Northumberland County; along Route 610, 1 mile north of Browns Store):

A_p 0 to 7 inches, yellowish-brown (10YR 5/4), friable very fine sandy loam; moderate, fine, granular structure; many fine roots; abrupt, smooth boundary.

B_2 7 to 23 inches, brownish-yellow (10YR 6/6), friable, light silty clay loam; moderate, medium, subangular blocky structure; few, fine roots; few wormholes; occasional, small, rounded quartz pebbles; few, medium, faint mottles of pale brown and yellowish brown in lower 3 inches; abrupt, smooth boundary.

B_m 23 to 34 inches, brownish-yellow (10YR 6/6) sandy loam; many, distinct, fine, medium, and coarse mottles of light gray (10YR 7/1) and strong brown (7.5YR 5/6); brittle, firm to hard; moderately thick, platy structure; many, fine, rounded quartz pebbles; gradual, smooth boundary.

C 34 to 60 inches +, yellowish-red (5YR 5/8) fine sandy clay loam; many, fine and medium, distinct mottles of reddish yellow (7.5YR 6/8) and brownish yellow (10YR 6/6); friable; few, fine, rounded quartz pebbles and few small fragments of ferruginous sandstone.

Range in characteristics: The slowly permeable fragipan is generally at a depth of about 24 inches, but the range is from 20 to 30 inches. The texture of the upper layers ranges from very fine sandy loam to silt loam. The surface layer ranges from very pale brown to yellowish brown in color, and from about 5 to 11 inches in thickness. The subsoil ranges from yellow to strong brown, and from sandy clay loam to silty clay loam. A few small areas have a weakly developed fragipan.

This soil is low in natural fertility, moderately low in moisture-holding capacity, and strongly acid (pH 5.0–5.5). Water penetrates the upper horizon readily, but it penetrates the hardpan, or fragipan, very slowly. As a result, the upper horizons are easily waterlogged, a condition that reduces the supply of air and restricts the growth of roots. In wet seasons, wetness delays fieldwork longer than on the Sassafras and other better drained soils. The capacity for available water is moderate to low. Runoff is not a great hazard.

Use and management: Most of this soil is wooded. Several areas are cultivated; the rest is pastured and idle.

This soil is best suited to small grains and to pasture and hay plants that are adapted to local conditions. It is poorly suited to alfalfa, but corn and soybeans yield fairly well. The miry condition of the soil for long periods after rains greatly interferes with tillage. Wetness of the soil sometimes prevents timely harvests and causes loss of crops. (Capability unit IIIs–2.)

Beltsville very fine sandy loam, gently sloping (2 to 6 percent slopes) (BeB).—This soil differs from Beltsville very fine sandy loam, nearly level, in having more slope. In addition, the texture of the 6- to 7-inch surface layer is more variable, and runoff is more of an erosion hazard. Wetness after rains is less of a problem.

Use and management: Most of this soil is wooded. Some of it is cultivated and pastured, and a small part is idle.

This soil is best suited to small grains, pasture, and hay. Corn and soybeans yield fairly well, but tillage and harvest are hampered at times by the wet, miry soil. (Capability unit IIIs–2.)

Beltsville very fine sandy loam, gently sloping, eroded (2 to 6 percent slopes) (BeB2).—This soil differs from Beltsville very fine sandy loam, gently sloping, in having a thinner surface soil. Subsoil is exposed in small areas on the steepest slopes. The fragipan is at a depth of 20 to 26 inches. A few severely eroded areas are included. In these areas, tillage is more difficult than in other parts of this mapping unit.

Use and management: Most of this soil is in forest or in cultivation. Some is used for pasture and hay, and some is idle.

This soil is best suited to small grains and to hay and pasture plants that are adapted to local conditions. Corn and soybean yields are fair. Tilling and harvesting are often severely delayed when this soil is wet. As a result, crops are often lost because harvesting equipment cannot be operated on the wet, miry soil. (Capability unit IIIs–2.)

Bertie silt loam (0 to 2 percent slopes) (Br).—This soil occurs mainly on neckland that has formed from Coastal Plains sediment consisting of sand, silt, and clay. A few small areas are in depressions on the high marine terraces.

This soil is the somewhat poorly drained member of the catena that includes the well drained Matapeake, the moderately well drained Mattapex, and the poorly drained Othello soils. It is also associated with coarses textured Dragston, Fallsington, and Woodstown soils. Bertie silt loam has the same color and drainage characteristics as the Dragston soils. It is better drained than the Fallsington and more poorly drained than the Woodstown. The native vegetation was mainly hardwoods.

Profile in an area reforested with pine (Northumberland County; about 1 mile east of Ophelia on Route 649, near the Potomac River, T. Ed Sanders cottage lane):

A_p 0 to 7 inches, light brownish-gray (10YR 6/2), friable silt loam; moderate, fine, granular structure; many, fine, medium, and coarse roots; clear, smooth boundary.

B_2 7 to 32 inches, light yellowish-brown (2.5Y 6/4), friable silty clay loam to clay loam; many to common, medium, prominent mottles of yellowish brown (10YR 5/8) and light gray (10YR 7/1); moderate, medium to fine, subangular blocky structure; many fine roots; few fine pores; gradual, wavy boundary.

B_3 32 to 43 inches, mottled gray to light-gray (N 6/0) and yellowish-brown (10YR 5/8), friable sandy loam to light sandy clay loam; weak, medium, subangular blocky structure; few fine pebbles of quartz; gradual, wavy boundary.

C 43 to 72 inches +, light-gray (2.5Y 7/2), loose sand; pockets of pale-brown (10YR 6/3) and light brownish-gray (2.5Y 6/2) loamy sand; few, fine and medium, distinct mottles of brownish yellow (10YR 6/6).

Range in characteristics: The surface soil is mainly silt loam, but small areas of very fine sandy loam and loam are included. The subsoil ranges from silty clay loam to heavy sandy clay loam. This layer is generally underlain by sand or loamy sand at a depth of 25 to 46 inches. A few areas are underlain by clayey material. Thin lenses and pockets of very sandy material occur in the subsoil.

Bertie silt loam is strongly to very strongly acid and medium in natural fertility. Permeability is moderate to slow. Internal drainage is slow because there is a fluctuating water table in the profile most of the time.

Use and management: Most of this soil is in forest. Some is cultivated, and some is pastured or idle. Undrained areas are best suited to pasture and forest. Good pastures can be grown if adequate fertilizer and proper pasture plants are used and other management is good. Corn and soybeans yield fairly well. Planting and cultivating, however, are often delayed when this soil is wet and miry. Crops are often damaged and sometimes completely lost because harvesting equipment cannot be operated on the wet soil. Artificial drainage allows the timely performance of fieldwork in all except the wettest periods. If management is good, drained areas of this soil are productive of most crops commonly grown in the area. (Capability unit IIw–2.)

Bladen silt loam (0 to 2 percent slopes) (Bt).—This is a poorly drained soil that has formed in thick beds of acidic clay and heavy sandy clay on a marine terrace of the lowest elevation. The 7-inch surface layer is dark grayish-brown silt loam; it is underlain by very dark gray, plastic silty clay loam. At a depth of 15 inches the plastic layer grades to gray, very plastic silty clay.

Bladen silt loam is a member of the catena that includes the Craven, Lenoir, and Elkton soils. It is associated with the Elkton, Fallsington, and Othello soils. It resembles the Elkton in texture but has a darker surface layer. It differs from the Fallsington and Othello soils in having a much finer texture throughout the profile and in being underlain by plastic clay. The native vegetation was mainly hardwoods.

Profile in a cultivated area (Northumberland County; near Kilmarnock on Byrdton Road):

A_p 0 to 7 inches, dark grayish-brown (2.5Y 4/2), friable silt loam; moderate, medium, granular structure; many fine and medium roots; many wormholes; abrupt, smooth boundary.

B_1 7 to 15 inches, very dark-gray (10YR 3/1), slightly plastic silty clay loam; few, fine, distinct mottles of yellowish brown (10YR 5/8); moderate, very coarse to medium, subangular blocky structure; many fine roots; occasional fine quartz pebbles; many wormholes; clear, wavy boundary.

B_{21} 15 to 29 inches, gray (N 5/0), very plastic silty clay; few, fine, distinct mottles of light olive brown (2.5Y 5/6); moderate, medium and coarse, prismatic structure; few fine roots; occasional fine quartz pebbles; gradual, wavy boundary.

B_{22} 29 to 40 inches, very dark gray (N 3/0), very plastic silty clay; few, fine, distinct mottles of light olive brown (2.5Y 5/6); moderate, medium and coarse, prismatic structure; few fine roots; occasional fine quartz pebbles; gradual, wavy boundary.

B_3 40 to 55 inches, very dark gray (N 3/0), plastic silty clay; many, medium, distinct mottles of light olive brown (2.5Y 5/6); moderate, coarse, prismatic structure; faces of peds coated with sandy material; root channels filled with sandy material; few fine pebbles of quartz; clear, wavy boundary.

C 55 to 86 inches, greenish-blue, slightly plastic and sticky sandy clay; many, medium, distinct mottles of yellowish brown (10YR 5/8); massive; few fine pebbles of quartz; shell marl between 86 and 90 inches; sandy clay loam below 90 inches.

Range in characteristics: The surface layer ranges from silt loam to very fine sandy loam. The subsoil ranges from fine sandy clay to silty clay or clay. Mottles in the subsoil are olive yellow, olive brown, yellowish brown, and in some instances greenish or bluish. The underlying strata are chiefly sandy clay loam, silty clay, or clay. In some places there are thin lenses, streaks, and pockets of sandy material in the subsoil and parent material.

This soil is medium in natural fertility, but the upper 15 inches is moderately high in organic matter. This soil is very strongly to strongly acid (pH 4.5–5.5). Surface runoff is very slow.

Use and management: The acreage of this soil is small and occurs mostly in one area in Northumberland County near Kilmarnock. Most of the acreage is in forest of hardwoods and pine. A small part has been cleared and is used for crops.

The plow layer is rather difficult to work because of wetness. Undrained areas are not suited to cultivation, because excess water leaves the soil slowly. If these areas are adequately drained and properly managed, however, moderately high yields can be obtained from most of the commonly grown crops.

Pasture and hay plants adapted to local conditions make fair to good yields of forage if adequate fertilizer and lime are used. Without artificial drainage, this soil is best suited to trees. (Capability unit IIIw–2.)

Caroline very fine sandy loam, gently sloping, eroded (2 to 6 percent slopes) (CfB2).—This well drained to moderately well drained soil is on the higher parts of the Coastal Plain. It has a yellowish-brown, firm silty clay loam subsoil, underlain at a depth of about 18 inches by mottled plastic clay. It is associated with the Beltsville and Kempsville soils and in places with the Sassafras soils. Caroline very fine sandy loam, gently sloping, eroded, has a finer texture and a firmer subsoil than the Sassafras and Kempsville soils. In addition, it has mottled plastic clay at a depth of 18 inches. It lacks the pan of the Beltsville soils and is a little better drained. The native vegetation is chiefly hardwoods.

Profile in an area covered with hardwoods and pines (Lancaster County; 1 mile southwest of Nuttsville on Route 618, 1/4 mile from Route 723):

A_0 1/2 inch to 0, dark reddish-brown (5YR 2/2), partially decomposed leaves and twigs.

A_2 0 to 8 inches, light yellowish-brown (10YR 6/4), friable very fine sandy loam; weak, fine, granular structure, many fine and medium roots; gradual, smooth boundary. Included is the A_1 layer, ½ inch thick, stained with organic matter.

B_{21} 8 to 18 inches, yellowish-brown (10YR 5/6), slightly plastic silty clay loam; moderate, medium and fine, subangular blocky structure; many fine and medium roots; gradual, wavy boundary.

B_{22} 18 to 36 inches, yellowish-red (5YR 5/6), plastic, heavy silty clay loam; many, medium, distinct mottles of brownish yellow (10YR 6/8); strong, medium, subangular blocky structure; few fine roots; gradual, wavy boundary.

C 36 to 50 inches, mottled brownish-yellow (10YR 6/8), red (2.5YR 5/6), and very pale brown (10YR 7/3), plastic silty clay; thin lenses of more sandy material; massive.

Range in characteristics: The surface layer ranges from very pale brown to yellowish brown in color, from very fine sandy loam to silt loam in texture, and from 5 to 12 inches in thickness. The subsoil ranges from yellowish red to red and from clay to sandy clay loam. This layer is generally underlain by material that ranges from clay loam to clay. The substratum in places is highly mottled with red and gray. In cultivated areas the surface layer has been mixed with subsoil. In severely eroded areas the subsoil is exposed, and here the plow layer is clay loam.

This soil is low in natural fertility, is strongly acid (pH 5.0–5.5), and is moderate in available moisture-holding capacity. The surface layer and upper subsoil are moderately permeable, but the material below a depth of 18 or 20 inches is very slowly permeable.

Use and management: The acreage of this soil is small, and most of it is wooded. A small acreage is cultivated, and yields are low. A few small areas are pastured or idle.

This soil is moderately productive of most crops commonly grown. Runoff is a moderate to severe hazard in cultivated areas and should be controlled to prevent erosion. If not severely eroded, the plow layer is fairly easy to work under average management. The soil is suited to very few crops. Most of it is best suited to hay and pasture. (Capability unit IIe–2.)

Caroline very fine sandy loam, sloping, eroded (6 to 10 percent slopes) (CfC2).—This soil differs from Caroline very fine sandy loam, gently sloping, eroded, in having steeper slopes and a shallower plow layer that is more difficult to work because it includes part of the clay subsoil.

Runoff is a serious hazard, and small areas of exposed subsoil are common. The soil is poorly suited to cultivated crops.

Use and management: Most of the acreage of this soil is in small wooded areas. Little is cropped; a few small areas are pastured or idle. Cleared areas are best suited to pasture. Yields of forage are fair to good if adequate amounts of lime and fertilizer are used, grazing is controlled, and other management is good. (Capability unit IVe–1.)

Caroline clay loam, sloping, severely eroded (6 to 10 percent slopes) (CaC3).—Erosion has removed 75 percent or more of the surface layer from this soil, and as much as 25 percent of its subsoil. The plow layer is likely to have poor tilth. Very slow permeability causes a large amount of runoff. Supplies of available moisture are low.

Use and management: Most of this soil is wooded. A few small areas have been cleared and are cropped, pastured, or idle. Poor tilth, slow permeability, and a serious erosion hazard make this soil very poorly suited to tillage. Fair yields of pasture and hay can be expected if management is good. (Capability unit VIe–1.)

Caroline clay loam, strongly sloping, severely eroded (10 to 15 percent slopes) (CaD3).—This soil has steeper slopes and a finer textured surface layer than Caroline very fine sandy loam, gently sloping, eroded. The surface layer is yellowish-brown, firm silty clay loam, 10 to 12 inches thick. Under this is mottled plastic clay. Strong slopes and slow permeability cause large amounts of runoff.

Use and management: Most of this soil is in forest; a few small areas are cultivated or pastured. The soil is difficult to work, and high productivity is difficult to maintain. Erosion is a severe hazard. The soil is not suitable for cultivation.

Cleared areas are moderately productive of pasture, but most of the acreage should be used for forestry. (Capability unit VIIe–1.)

Coastal beach (Co).—This land type occurs principally along the banks of the Potomac and Rappahannock Rivers and the Chesapeake Bay. Small areas are also along the large tidal creeks and other streams. The mapping unit consists of fine- to coarse-textured beach sand that is subjected to tidal wash. Most of the areas are narrow and lie between the water and steeply sloping banks or escarpments along the streams. They have no agricultural value and are best suited to recreational uses. (Capability unit VIIIw–1.)

Craven silt loam, nearly level (0 to 2 percent slopes) (CsA).—This fine-textured, moderately well drained soil is on the lower terraces, or neckland. It has formed in fine-textured Coastal Plain sediment, chiefly silt and clay. It is commonly adjacent to and a little higher than the somewhat poorly drained Lenoir and the poorly drained Elkton soils. It is also associated with the coarser textured Mattapex and Bertie soils. It is like the Mattapex in drainage and color but has a finer textured subsoil and is underlain in most places by clay and silty clay. It is better drained than the Bertie and Lenoir soils. The native vegetation was mainly hardwoods.

Profile in a cultivated area (Northumberland County; Mundy Point, on Courtney farm):

A_p 0 to 9 inches, grayish-brown (10YR 5/2), friable silt loam; moderate, medium, granular structure; many fine roots; occasional, fine, rounded quartz pebbles; clear, smooth boundary.

B_{21} 9 to 23 inches, yellowish-brown (10YR 5/6) to light olive-brown (2.5Y 5/6), firm clay loam; moderate, medium, subangular blocky structure; many fine roots; thin, patchy clay skins; occasional, fine, rounded quartz pebbles; root channels filled with surface soil; gradual, wavy boundary.

B_{22} 23 to 42 inches, light olive-brown (2.5Y 5/4), plastic silty clay; many, medium, distinct mottles of strong brown (7.5YR 5/8) and gray (10YR 5/1) splotched with pale brown and yellow; weak, medium to coarse, prismatic structure; structural faces coated with sandy material in upper part; clay skins distinct in lower part; occasional fine roots; occasional fine quartz pebbles; clear, wavy boundary.

C 42 to 93 inches, mottled gray (10YR 6/1), strong-brown (7.5YR 5/8), and dark-gray (10YR 4/1), very plastic clay; grades to solid gray in lower part; weak, coarse, prismatic structure in upper part grades to massive with increase in depth; occasional, fine, rounded quartz pebbles.

Range in characteristics: The surface layer ranges from pale brown to dark grayish brown and from silt loam to very fine sandy loam. It is mainly silt loam. The subsoil ranges from brownish yellow to olive brown and from sandy clay loam to clay. Under the subsoil is clay or silty clay. Thin lenses of sandy material are common in the subsoil and parent material.

This soil is moderately fertile and very strongly to strongly acid (pH 4.5–5.5). Runoff is slow, and erosion is not a hazard. This is a productive soil under good management. Water, air, and roots easily penetrate the surface layer but not the slowly permeable subsoil.

Use and management: About half the acreage is cropped, and a few areas are pastured or idle. The rest is forested. The soil is only fairly well suited to the crops generally grown in the area. Corn and soybean yields are fair if management is good. Artificial surface drainage may improve this soil for cultivation. If carefully managed, the soil is easy to till, but it stays wet a long time after rains and forms clods if worked when too wet or too dry.

The soil is best suited to pasture, hay, and small grains. It is not suited to alfalfa. Suitable varieties of pasture and hay plants provide good yields of forage. (Capability unit IIw–3.)

Craven silt loam, gently sloping, eroded (2 to 6 percent slopes) (CsB2).—This soil differs from Craven silt loam, nearly level, in slopes. It has lost 25 to 75 percent of the surface layer through erosion. Runoff is medium, and the hazard of erosion is moderate. A few small severely eroded areas are included. These areas have a clayey surface layer.

Use and management: Most of the acreage of this soil is cultivated or forested. The rest is pastured or idle.

This soil is best suited to pasture and hay. Good yields can be obtained if forage plants suited to local conditions are grown. The yields of corn and soybeans are fair if management is good. (Capability unit IIe–2.)

Craven silt loam, sloping, eroded (6 to 10 percent slopes) (CsC2).—This soil differs from Craven silt loam, gently sloping, eroded, in slopes. Runoff is medium to rapid, and the hazard of erosion is high.

Use and management: This soil occurs mainly at the heads of wooded drainageways. A few small areas are cultivated, pastured, or idle.

This soil is best suited to permanent pasture or forest. Fair pastures can be maintained if management is good, adequate quantities of lime and fertilizer are used, and grazing is controlled. (Capability unit IVe–1.)

Craven clay loam, strongly sloping, severely eroded (6 to 15 percent slopes) (CrD3).—This soil differs from Craven silt loam, sloping, eroded, in having steeper slopes and in having lost 75 percent of the surface layer and up to 25 percent of the subsoil through erosion. The surface layer has been mixed with the upper subsoil during tillage and is now clay loam. Workability and productivity are poor. Runoff is rapid, and the hazard of erosion is high to very high. The surface layer is moderately to slowly permeable.

Use and management: Most of this soil is cropped or forested. A few small areas are pastured or idle. This soil is best suited to pasture and forest. (Capability unit VIIe–1.)

Dragston fine sandy loam (0 to 2 percent slopes) (Dr).—This soil occurs mainly on broad, flat areas of neckland that have formed from marine sand, silt, and clay. A few small areas in the higher elevations are in depressions and in the heads of drainageways.

This soil is the somewhat poorly drained member of the catena that includes the well drained Sassafras, the moderately well drained Woodstown, and the poorly drained Fallsington soils. It is also associated with the finer textured Mattapex, Bertie, and Othello soils. It is better drained than the Othello soils and more poorly drained than the Mattapex. Color and drainage of Dragston fine sandy loam correspond closely to those of the Bertie soils. The native vegetation was mainly hardwoods.

Profile in a cultivated area (Lancaster County; near Ottoman, ½ mile east of the Hartsville Church on Route 625, on the Grover Norris farm):

A_p 0 to 9 inches, dark grayish-brown (2.5Y 4/2) to grayish-brown (2.5Y 5/2), very friable fine sandy loam; weak, fine, granular structure; many fine roots; clear, smooth boundary.

B_2 9 to 27 inches, light brownish-gray (2.5Y 6/2) to light yellowish-brown (2.5Y 6/4), friable, light sandy clay loam; many, medium, distinct mottles of strong brown (7.5YR 5/8) and few, medium mottles of gray (N 5/0); many medium and fine pores; few fine roots; gradual, wavy boundary.

B_3 27 to 35 inches, gray (N 5/0), friable fine sandy loam; many, medium, distinct mottles of brownish yellow (10YR 6/6); occasional fine roots; gradual, wavy boundary.

C 35 to 60 inches, light-gray (N 7/0), loose loamy fine sand; many, coarse, distinct mottles of brownish yellow (10YR 6/8); grades to sand.

Range in characteristics: This soil is 24 to 42 inches thick over sand and loamy sand. The surface layer ranges from pale brown to dark grayish brown, and from sandy loam to loam. It generally is fine sandy loam. The subsoil ranges from light yellowish brown to brownish gray mottled with gray, and from light fine sandy clay loam to loam or sandy loam. Thin lenses of heavier material are common in the subsoil.

Dragston fine sandy loam is strongly acid and low in natural fertility. It is moderately permeable to water, but only the upper horizons are aerated because there is a fluctuating water table.

Use and management: About half the acreage of this soil is wooded; some of the acreage is cropped, and the rest is pastured or idle. Corn and soybeans are the main crops, and yields are fair to good. Planting, cultivating, and harvesting are often hampered by wetness. Suitable varieties of pasture and hay plants produce good yields of forage if management is good.

Artificial drainage is essential if the soil is to be cultivated intensively. If drained and properly managed, the soil is easy to work and fairly productive of many crops that are grown in the area. (Capability unit IIw–2.)

Elkton silt loam (0 to 2 percent slopes) (Ek).—This fine-textured, poorly drained soil occurs on neckland that has formed from Coastal Plain sediment consisting mostly of silt and clay. Elkton silt loam is the poorly drained member of the catena that includes the moderately well drained Craven and the somewhat poorly drained Lenoir soils. It is also associated with the coarser textured Bertie and Othello soils. Elkton silt loam is more poorly drained than the Bertie and is generally underlain by clayey deposits. It closely resembles the Othello in color but is finer textured throughout the profile. The underlying strata in Elkton silt loam are usually silty clay to clay, whereas they are sand in the Othello soils. The native vegetation was mainly hardwoods.

Profile in a forest of mixed hardwoods and pine (Northumberland County; near Mundy Point on Route 620, ¼ mile north of Route 621):

A_0 1 inch to 0, thin scattering of partially decomposed leaves and twigs; some large spots on which are growing wetland reeds and grasses.

A_1 0 to 2 inches, very dark brown (10YR 2/2), friable silt loam; moderate, medium, granular structure; matted with fine, medium, and coarse roots; many earthworms; clear, smooth boundary.

A_2 2 to 8 inches, gray (10YR 5/1), friable silt loam; few, medium, distinct mottles of yellowish brown (10YR 5/8) and olive yellow (2.5Y 6/8); weak, medium, subangular blocky structure; many, fine to medium roots; few fine to medium pores; gradual, smooth boundary.

B_{21} 8 to 16 inches, gray (10YR 5/1), plastic, heavy silty clay loam; many, medium, distinct mottles of yellowish brown (10YR 5/8); moderate, medium, subangular blocky structure; few fine pores; few fine and medium roots; clear, wavy boundary.

B_{22} 16 to 45 inches, dark-gray (10YR 4/1), very plastic silty clay; many, distinct, medium and coarse mottles of yellowish brown (10YR 5/8); moderate, coarse, prismatic structure; structural faces coated with sandy material; few fine pebbles of quartz; diffuse, irregular boundary.

C 45 to 62 inches, mottled light brownish-gray (2.5Y 6/2), gray (N 5/0), yellowish-brown (10YR 5/8), and dark-gray (10YR 4/1), very plastic clay; occasional, medium, prominent mottles of green; massive; pockets and root channels filled with sandier material.

Range in characteristics: The surface layer ranges from silt loam to very fine sandy loam. It is mainly silt loam. The subsoil ranges from clay loam to clay. This layer is gray with distinct mottles of brownish yellow, olive yellow, and variations of blue and green. The underlying material ranges from silty clay to clay. Thin lenses, streaks, and pockets of sandy material are common in the subsoil and parent material.

This soil is medium in natural fertility and strongly to very strongly acid (pH 4.5–5.5). Runoff is very slow; erosion is slight. Workability and productivity are very poor. Internal drainage is very slow, and water stands on the surface in wet seasons. Unless artificially drained, this soil can be used for only a few crops. It is best suited to forest.

Use and management: Most of this soil is wooded. A few small areas have been cleared and are pastured or cultivated.

If properly drained, this soil is fairly well suited to most crops grown in the area. Forage plants suited to the soil and climate make fair to good pasture if management is good and adequate amounts of lime and fertilizer are used. (Capability unit IIIw-2.)

Fallsington fine sandy loam (0 to 2 percent slopes) (Fa).—This soil occupies broad areas of neckland that consist of marine sand, silt, and clay. A few small areas are in depressions at the higher elevations. This soil is the poorly drained member of the catena that includes the well drained Sassafras, the moderately well drained Woodstown, and the somewhat poorly drained Dragston soils. It is also associated with the finer textured Bertie and Othello soils. It is more poorly drained than the Bertie but has the same color and drainage as the Othello. The native vegetation was mostly hardwoods.

Profile in a forest of mixed hardwoods and pine (Lancaster County; Ottoman area, ¼ mile east of the Hartsville Church on Route 625) :

A_0 2 inches to 0, dark reddish-brown (5YR 2/2), partially decomposed forest litter of leaves and twigs, held in mat of fine roots.

A_1 0 to 3 inches, dark-gray (10YR 4/1), very friable fine sandy loam; weak, fine, granular structure; layer matted with fine roots; gradual, wavy boundary.

A_2 3 to 7 inches, gray (10YR 5/1) to grayish-brown (10YR 5/2), friable fine sandy loam; moderate, medium and fine, granular structure; many, large, medium, and fine roots; gradual, smooth boundary.

B_2 7 to 27 inches, gray (10YR 5/1), friable, light fine sandy clay loam; many, medium, distinct mottles of yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6); moderate, medium, subangular blocky structure; few fine roots; gradual, wavy boundary.

B_3 27 to 34 inches, gray (10YR 5/1), friable, heavy fine sandy loam; many, coarse, distinct mottles of strong brown (7.5YR 5/6); weak, medium, subangular blocky structure; few fine roots; clear, wavy boundary.

C 34 to 65 inches, light-gray (N 7/0), loose loamy sand; many, coarse, distinct mottles of brownish yellow (10YR 6/6); single grain.

Range in characteristics: The surface layer ranges from light fine sandy loam to very fine sandy loam. The subsoil ranges from light fine sandy clay loam to sandy loam. Thin lenses and pockets of finer textured soil material are also common in the subsoil. The subsoil is usually underlain by sand or loamy sand at a depth ranging from about 24 to 42 inches.

Fallsington fine sandy loam is strongly to very strongly acid and is medium in natural fertility. It is moderately permeable to water. Internal drainage is very slow because of the high water table.

Use and management: Most of this soil is forested. The rest is cropped, pastured, or idle. Unless drained, the soil is best suited to forestry (fig. 4). If drained, the soil is easily worked and fairly productive of most crops commonly grown in the area.

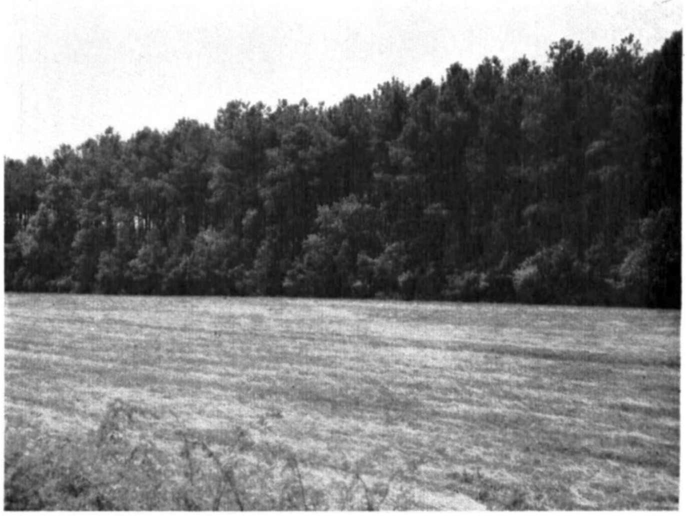

***Figure 4.*—Pasture and loblolly pine are suited to the poorly drained Fallsington fine sandy loam. This soil should be drained artificially if it is to be used for row crops.**

Fair to good yields of corn and soybeans can be expected if drainage is adequate. With good management and a minimum of drainage, forage plants suited to the soil and climate produce good pasture. (Capability unit IIIw-1.)

Kempsville fine sandy loam, nearly level (0 to 2 percent slopes) (KeA).—This well-drained, moderately deep soil is mainly on high terraces consisting of marine sand, silt, and clay. It is associated with the Sassafras, Woodstown, and Beltsville soils and with the Steep and Sloping sandy lands. Kempsville fine sandy loam, nearly level, differs from the Sassafras soils in having paler surface-layer and subsoil colors, a slightly compacted (weak fragipan) horizon, and low-contrast mottling in the lower horizons of the subsoil. It differs from the Woodstown in having a better drained and less mottled profile. From the Beltsville it differs in lacking a strongly developed fragipan, or in having the fragipan at a greater depth (40 to 50 inches) in the profile. The native vegetation was mostly hardwoods.

Profile in a forest of mixed hardwoods and pines (Northumberland County; Moon Corner, on Route 600, ¼ mile north of Route 601):

A_0 1 inch to 0, nearly black, partially decayed leaves and twigs held in mat of fine roots.

A_1 0 to 2 inches, very dark grayish-brown (10YR 3/2), friable fine sandy loam; weak, fine, granular structure; many fine and medium roots; clear, wavy boundary.

A_2 2 to 11 inches, light yellowish-brown (10YR 6/4), friable fine sandy loam; moderate, medium and fine, granular structure; many fine and medium roots; gradual smooth boundary.

B_1 11 to 14 inches, brownish-yellow (10YR 6/6), friable, light fine sandy clay loam; weak, fine and medium, subangular blocky structure; few fine and medium roots; gradual, wavy boundary.

B_{21} 14 to 29 inches, yellowish-brown (10YR 5/8), friable very fine sandy clay loam; weak, medium, subangular blocky structure; few fine and medium roots; gradual, wavy boundary.

B_{22} 29 to 42 inches, yellowish-brown (10YR 5/6) to brownish-yellow (10YR 6/6) fine sandy loam; many, distinct, fine and medium mottles of pale brown (10YR 6/3); slightly compact, friable but slightly brittle; weak, thick, platy structure; few fine pores; few fine roots; clear, smooth boundary.

B_m 42 to 55 inches, light yellowish-brown (10YR 6/4) fine sandy loam; many, medium, distinct mottles of light brownish gray (10YR 6/2) and yellowish brown (10YR 5/4); compact, slightly brittle; moderate, thick, platy structure; gradual, wavy boundary; horizon seems very hard when digging, but peds crush easily in fingers.

C 55 to 66 inches, strong-brown (7.5YR 5/8), friable fine sandy clay loam; few, medium, distinct mottles and streaks of brownish yellow (10YR 6/8) and red (2.5YR 4/8).

Range in characteristics: The surface layer ranges from light brownish gray to brown and dark grayish brown, and from fine sandy loam to loam. It is mainly fine sandy loam. The subsoil ranges from strong brown to brownish yellow, and from sandy loam to sandy clay loam. Depth to the weak, fragipanlike layer averages about 30 inches. This weak fragipan is often underlain at a depth of 40 to 45 inches by a strongly developed fragipan. Included with this soil are a few small areas resembling the Orangeburg soil (not mapped in Northumberland and Lancaster Counties).

Kempsville fine sandy loam, nearly level, is medium in natural fertility and is strongly acid (pH 5.0 to 5.5). The surface layer and upper subsoil are moderately permeable, but compacted layers reduce the permeability of the lower subsoil. Workability and productivity are good. The moisture-holding capacity is medium.

Use and management: Most of the acreage of this soil is wooded. A large part is cultivated, a small part is pastured, and very little is idle. Corn, soybeans, and small grains produce good yields if adequate fertilizer and lime are used. Pasture and hay plants suited to the soil produce good forage. Alfalfa is not suited, because of the restricted drainage in the lower subsoil.

This soil can be cropped intensively if management is good and adequate amounts of fertilizer and lime are used. It is responsive to management. (Capability unit I–1.)

Kempsville fine sandy loam, gently sloping (2 to 6 percent slopes) (KeB).—This soil differs from Kempsville fine sandy loam, nearly level, in having steeper slopes, greater runoff, and more variable texture in the surface layer. The water-absorbing qualities of this soil are good, however.

Use and management: Most of the acreage is wooded. Some of it is cultivated, some is pastured, and a small part is idle. The yields of most crops are good on this soil. Good yields of pasture and hay crops other than alfalfa are easily maintained. Good yields of all crops require the use of adequate amounts of lime and fertilizer. The soil is responsive to management. (Capability unit IIe–1.)

Kempsville fine sandy loam, gently sloping, eroded (2 to 6 percent slopes) (KeB2).—This soil differs from Kempsville fine sandy loam, gently sloping, in having lost from 25 to 75 percent of the surface layer through erosion. In addition, the profile is thinner and the texture of the surface layer is more variable. In places the texture ranges from sandy loam to sandy clay loam. Runoff is medium.

Use and management: Most of the acreage is wooded, but a large part is cultivated. Some of the acreage is pastured or idle. The soil is well suited to most crops grown in the area. Corn, soybeans, and small grains yield well if management is good.

Productivity can be maintained through the use of short crop rotations if management is good. (Capability unit IIe–1.)

Kempsville fine sandy loam, sloping, eroded (6 to 10 percent slopes) (KeC2).—This soil differs from Kempsville fine sandy loam, gently sloping, eroded, in having steeper slopes. Runoff is medium to rapid, and the hazard of erosion is moderate to high. Productivity is only fair.

Use and management: Most of the acreage is wooded. The rest is cropped and pastured. If cultivated, this soil needs intensive management to protect it from erosion.

Kempsville fine sandy loam, sloping, eroded, is best suited to permanent sod crops or to trees. Cleared areas produce good pasture and hay under good management. (Capability unit IIIe–1.)

Kempsville fine sandy loam, sloping, severely eroded (6 to 10 percent slopes) (KeC3).—This soil differs from Kempsville fine sandy loam, sloping, eroded, in having lost most of the surface soil and part of the subsoil through erosion. Runoff is rapid. The water-holding capacity is low. Productivity is poor.

Use and management: Most of the acreage is in the heads of drainageways and is used, together with areas on the milder slopes, to square up the boundaries of cultivated fields. This soil is best suited to permanent pasture or trees. (Capability unit IVe–1.)

Lakeland loamy fine sand, gently sloping (0 to 6 percent slopes) (LaB).—This excessively drained soil occupies neckland that has formed from the sandier types of Coastal Plain sediment. It is associated with the thick surface phases of Sassafras loamy fine sand and with the moderately well drained Woodstown soils. Lakeland loamy fine sand, gently sloping, differs from the thick surface phases of Sassafras loamy fine sand, in having a coarser texture and a paler color throughout the profile. It is better drained and coarser textured than the Woodstown soils. This soil has practically no textural subsoil development. It is very rapidly permeable.

Profile in a cultivated area (Lancaster County; near Weems, ¼ mile north of Route 630, ¼ mile northwest of Wesley Church, on the F. Lackart property):

A_p 0 to 9 inches, grayish-brown (10YR 5/2), loose to very friable loamy fine sand; very weak, fine, granular structure; many fine and medium roots; abrupt, smooth boundary.

AB 9 to 26 inches, light yellowish-brown (10YR 6/4), loose to very friable loamy fine sand; very weak, fine, granular structure; few thin (¼ inch) lenses of strong-brown (7.5YR 5/6) loamy fine sand in lower 6-inch part; few fine roots; gradual, wavy boundary.

C 26 to 51 inches, very pale brown (10YR 8/4), loose fine sand; single grain; several irregular layers, ¼ to 1 inch thick, of strong-brown (7.5YR 5/6) loamy fine sand; these appear to be thin B horizons; clear, wavy boundary.

D 51 to 75 inches, yellowish-brown (10YR 5/8), friable, light fine sandy clay loam streaked with strong brown (7.5YR 5/8); weak, medium, subangular blocky structure.

Range in characteristics: The thickness of the loamy fine sand ranges from about 24 to 50 inches. This material is generally underlain by loose sand. The color of the surface layer ranges from grayish brown to a very pale brown; that of the subsoil, from very pale brown to yellowish brown. The subsoil may have only a slight textural development and is loose or very friable. The lower subsoil and underlying strata may or may not have the brighter colored, thin layers described in the profile.

This soil is low in natural fertility and moisture-holding capacity and is strongly acid. Permeability and internal drainage are very rapid. This soil is suited to only a few crops. Workability is excellent. Productivity is low.

Use and management: Most of this soil is wooded. A few areas have been cleared and are cultivated. This soil is poorly suited to the general crops grown in the area, but it is fairly well suited to early market vegetables and melons. (Capability unit IIIs-1.)

Lenoir silt loam (0 to 2 percent slopes) (Le).—This fine-textured, somewhat poorly drained soil occupies areas of neckland, or lower terraces, that have formed in Coastal Plain sediment consisting mostly of silt and clay. It is the somewhat poorly drained member of the catena that includes the moderately well drained Craven and the poorly drained Elkton soils. It is also associated with the coarser textured Mattapex and Bertie soils. Lenoir silt loam is more poorly drained than the Mattapex soils; its substrata are finer textured than those in the Mattapex soils. This soil resembles the Bertie soil in color and drainage but is finer textured throughout the profile. The native vegetation was mainly hardwoods.

Profile in an area reforested with pine (Northumberland County; Mundy Point, on the Courtney farm):

A_{00} 1 inch to 0, thin covering of undecomposed pine needles.

A_p 0 to 7 inches, grayish-brown (2.5Y 5/2), friable silt loam; few, fine, faint mottles of brown (10YR 5/2) and yellowish brown (10YR 5/6); moderate, fine, granular structure; many fine and medium roots; occasional, fine, rounded quartz pebbles; abrupt, smooth boundary.

B_{21} 7 to 16 inches, light yellowish-brown (2.5Y 6/4), slightly plastic clay loam; many, medium, distinct mottles of brownish yellow (10YR 6/6), gray (10YR 6/1), and strong brown (7.5YR 5/6); moderate, medium, subangular blocky structure; few fine roots; occasional, fine, rounded quartz pebbles; gradual, wavy boundary.

B_{22} 16 to 36 inches, gray (N 5/0), plastic silty clay; many, medium, distinct mottles of strong brown (7.5YR 5/8); moderate, coarse, prismatic structure; structural faces coated with sandy material; few fine roots; occasional, fine, rounded quartz pebbles; gradual, wavy boundary.

C 36 to 72 inches, light olive-gray (5Y 6/2), very plastic clay; few, medium, distinct mottles of strong brown (7.5YR 5/8); massive; contains pockets filled with gray (N 5/0), somewhat coarser textured materials.

Range in characteristics: The surface layer ranges from light brownish gray to brown, and from silt loam to very fine sandy loam. It is mainly silt loam. The subsoil ranges from brownish yellow to olive brown, and from sandy clay to clay. It has distinct mottles of gray, strong brown, and yellow. The underlying material is usually silty clay or clay. Thin lenses, streaks, and pockets of sandy material often occur in the subsoil and parent material.

This soil is medium in natural fertility and very strongly to strongly acid (pH 4.5–5.5). Runoff is very slow, and the hazard of erosion is slight. Workability and productivity are poor. The surface layer and upper parts of the subsoil are permeable to air and to some extent to plant roots. Below this is the water table.

Use and management: Most of the acreage is forested. The rest is cultivated, pastured, used as meadow, or idle. The soil is poorly suited to corn and soybeans because it is miry a long time after rains, and this interferes with tillage and harvesting. The soil forms clods if worked when too wet or too dry. Artificial drainage is needed if the soil is to be cultivated.

Cleared areas of this soil are best suited to pasture and hay plants that can grow under local climatic and soil conditions. Good yields of forage can be obtained if proper quantities of lime and fertilizer are used and other management is good. (Capability unit IIIw-2.)

Local alluvial land (2 to 6 percent slopes) (Lo).—This well drained to moderately well drained land type has formed in colluvial material that washed from slightly higher adjoining slopes. It normally occupies small depressions within large areas of the Sassafras and Kempsville soils. A few areas are at the bases of terrace escarpments. This land type has had little horizon development. The texture of the surface layer ranges from fine sandy loam to silt loam, and it is generally finer than that of surrounding soils. The native vegetation was mainly hardwoods.

Profile in a cultivated area (Northumberland County; Mantua farm, near Hamlins Corner):

A_p 0 to 11 inches, dark yellowish-brown (10YR 4/4), friable loam; moderate, fine, granular structure; many fine roots; gradual, smooth boundary.

C 11 to 46 inches, brown to dark-brown (7.5YR 4/4), friable loam to silt loam; moderate, fine, granular structure; many fine roots; occasional fine quartz pebbles; gradual, smooth boundary.

A_{1b} 46 to 52 inches, dark-brown (7.5YR 3/2), friable, light silty clay loam; few, fine, faint mottles of strong brown (7.5YR 5/6) and pale brown (10YR 6/3); weak, medium and fine, subangular blocky structure; few, small, dark-brown and black concretions; few, very fine pebbles of quartz; few fine roots; clear, smooth boundary.

B_{2b} 52 to 66 inches, strong-brown (7.5YR 5/6), friable silty clay loam; moderate, medium, subangular blocky structure; few fine quartz pebbles.

Range in characteristics: The surface layer ranges from very dark brown to light brown, and from silt loam to fine sandy loam. The subsoil ranges from brown to brownish yellow. The B horizon has not formed in all the subsoil, but it is moderately well developed in some places. The solum ranges from about 25 to 50 inches in thickness and is underlain by material similar to that of the surrounding soils.

This soil is medium in natural fertility, high in moisture-holding capacity, and strongly acid (pH 5.0-5.5). It is very responsive to management. It is readily permeable to air, water, and roots. Workability is good; productivity is excellent.

Use and management: This soil occupies small depressions. Most of the acreage is cultivated with areas of adjoining soils. Some of the acreage is forested and some is pastured.

This soil is well suited to corn and other general crops grown in the area. It is also well suited to hay and pasture crops other than alfalfa. It is excellent for gardens and many kinds of vegetables. (Capability unit IIw-1.)

Matapeake silt loam, nearly level (0 to 2 percent slopes) (MaA).—This moderately deep, well-drained, brown soil has formed in Coastal Plains sediment consisting of sand, silt, and clay. It occurs mainly at lower elevations and on points that border tidal creeks and rivers. It is the well drained member of the catena that includes the moderately well drained Mattapex, the somewhat poorly drained Bertie, and the poorly drained Othello soils. It is also associated with the Sassafras and Woodstown soils. Matapeake silt loam, nearly level, resembles the Sassafras soils in color but is finer textured throughout the profile. It is better drained and brighter colored than the Mattapex soils. The native vegetation was mainly hardwoods.

Profile in a cultivated area (Northumberland County; near Lilian, bordering the Little Wicomico River, on the Locksley Hall farm):

A_p 0 to 9 inches, brown to dark-brown (7.5YR 4/4), friable silt loam; moderate, fine, granular structure; many fine roots; few, fine, rounded pebbles of quartz; many wormholes; clear, smooth boundary.

B_2 9 to 32 inches, strong-brown (7.5YR 5/6), light clay loam; friable, slightly sticky; moderate, medium, subangular blocky structure; many fine roots; few, fine, rounded pebbles of quartz; many medium and fine pores; clay skins patchy and thin; gradual, wavy boundary.

B_3 32 to 40 inches, strong-brown (7.5YR 5/6), friable fine sandy clay loam; weak, medium, subangular blocky structure; few fine roots; few, fine, rounded pebbles of quartz; many medium and fine pores; gradual, wavy boundary.

C 40 to 66 inches, strong-brown (7.5YR 5/6), very friable sandy loam; small, rounded pebbles of quartz make up about 10 percent of volume; weak, fine, crumb structure; gradual, wavy boundary.

D 66 to 94 inches, brownish-yellow (10YR 6/6), loose loamy sand; single grain; occasional, fine, rounded quartz pebbles.

Range in characteristics: The surface layer ranges from dark brown to pale brown, from silt loam to fine sandy loam, and from 8 to 16 inches in thickness. It is mainly silt loam. The subsoil ranges from yellowish brown to yellowish red, from fine sandy clay loam to silty clay loam, and from 20 to 30 inches in thickness. The depth to sandier sediment is generally 36 inches, but it ranges from 28 to 46 inches.

This soil is medium in natural fertility, high in moisture-holding capacity, and strongly acid (pH 5.0-5.5). It is very responsive to management. It is readily permeable to air, water, and roots and is suited to a very wide range of crops. The soil can be tilled safely over a wide range of moisture conditions and is easily worked.

Use and management: Most of this soil is cultivated. Some is forested, a small part is pastured, and very little is idle. This is the most productive soil in Northumberland and Lancaster Counties. It can be cropped intensively if adequate quantities of lime and fertilizer are used and other management is good. Alfalfa can be grown through application of adequate lime and fertilizer. Corn and soybean yields are excellent. Medium to low fertility limits the productivity of this soil. (Capability unit I-1.)

Matapeake silt loam, gently sloping (2 to 6 percent slopes) (MaB).—This soil differs from Matapeake silt loam, nearly level, in having less slope; a somewhat sandier, paler, and slightly shallower surface layer; and slightly more runoff. Water-absorbing qualities are good.

Use and management: Most of the acreage is cultivated. Some is forested, some is pastured, and very little is idle. Woodland is dominant on the narrow points and in the irregular-shaped areas.

This soil is suited to many kinds of crops. Productivity can be maintained through the use of short rotations if adequate amounts of lime and fertilizer are used and other management is good. The moisture-supplying capacity is less than that of Matapeake silt loam, nearly level, and this results in lower yields. (Capability unit IIe-1.)

Matapeake silt loam, gently sloping, eroded (2 to 6 percent slopes) (MaB2).—This soil differs from Matapeake silt loam, gently sloping, in having lost from 25 percent to as much as 75 percent of the surface soil through erosion. Runoff is medium, and the hazard of erosion is moderate.

Use and management: Most of the acreage is cultivated. Some is forested, some is pastured, and very little is idle. The higher rate of runoff allows less water for growing plants and may account for lower yields than those obtained from crops grown on Matapeake silt loam, gently sloping.

This soil is suited to many kinds of crops. Productivity can be maintained through the use of short rotations if adequate amounts of lime and fertilizer are used and other management is good. (Capability unit IIe-1.)

Matapeake silt loam, sloping, eroded (6 to 10 percent slopes) (MaC2).—This soil differs from Matapeake silt loam, gently sloping, eroded, in having steeper slopes, more runoff, and a somewhat higher hazard of erosion. Productivity is only fair. A few small severely eroded areas are included.

Use and management: Most of this soil is forested. Some of it is cultivated, some is pastured, and a little is idle. The soil is best suited to close-growing crops and long-term crop rotations. To shape up field boundaries, some of the acreage is cultivated intensively with areas of soils on milder slopes. The conservation of soil and moisture requires intensive management. (Capability unit IIIe-1.)

Matapeake silt loam, strongly sloping, eroded (10 to 15 percent slopes) (MaD2).—This soil differs from Matapeake silt loam, sloping, eroded, in having steeper slopes, more runoff, and a higher hazard of erosion. Workability is fair to poor. A few small severely eroded areas are included.

Use and management: Most of the acreage of this soil is wooded. Some of the acreage is cultivated to square up field boundaries, and some is pastured or idle. Productivity is poor, and only a few crops can be grown.

This soil is best suited to permanent sod crops or to trees. Yields of the general crops are low. Pastures produce fair yields of forage if proper amounts of lime and fertilizer are used and other management is good. The use of machinery is somewhat restricted. (Capability unit IVe–1.)

Mattapex silt loam (0 to 2 percent slopes) (Mt).—This moderately well drained soil is mainly on the lower terraces, or on neckland. It has formed in Coastal Plain sediment consisting of sand, silt, and clay. It is the moderately well drained member of the catena that includes the well drained Matapeake, the somewhat poorly drained Bertie, and the poorly drained Othello soils. It is also associated with the coarser textured Woodstown and Dragston soils. Mattapex silt loam closely resembles the Woodstown soils in drainage but is better drained than the Dragston soils. The native vegetation was mainly hardwoods. (Capability unit IIw–1.)

Profile in a forest of mixed hardwoods and pines (Northumberland County; Mob Neck, on Route 740, ½ mile east of Route 604):

A_0 1 inch to 0, partially decayed, nearly black leaves and twigs held loosely by many fine roots.

A_1 0 to 2 inches, very dark gray (5YR 3/1), friable silt loam; weak, fine and medium, granular structure; many fine and medium roots; clear, smooth boundary.

A_2 2 to 10 inches, light yellowish-brown (2.5Y 6/4), friable silt loam; moderate, fine and medium, granular structure; many fine and medium roots; gradual, smooth boundary.

B_1 10 to 15 inches, light olive-brown (2.5Y 5/6), friable, heavy silt loam; weak, medium, subangular blocky structure; many fine roots; gradual, wavy boundary.

B_2 15 to 36 inches, yellowish-brown (10YR 5/8) to brownish-yellow (10YR 6/8), friable silty clay loam; weak, medium, subangular blocky structure; many, fine and medium, distinct mottles of gray (10YR 5/1) below depth of 22 inches; many fine roots; gradual, wavy boundary.

B_3 36 to 40 inches, light olive-brown (2.5Y 5/6), friable, light fine sandy clay loam; many, medium, distinct mottles of gray (10YR 5/1) and few, medium, distinct mottles of strong brown and yellowish brown; weak, medium, subangular blocky structure; few fine roots; gradual, wavy boundary.

C 40 to 60 inches, yellowish-brown (10YR 5/8), loose loamy sand streaked with white, pale brown, and strong brown; occasional fine roots; few, fine, rounded pebbles of quartz.

Range in characteristics: The surface layer in cultivated areas has been mixed with subsoil during tillage to form the present plowed layer. This layer ranges from pale brown to brown, and from very fine sandy loam to silt loam. It is mainly silt loam. The subsoil ranges from brownish yellow to olive brown, and from silty clay loam to heavy fine sandy clay loam. The subsoil is in most places underlain by sand and loamy sand at a depth of 25 to 46 inches. A few small areas having olive-colored subsoil are included. Also included are a few small areas that have slopes as much as 6 percent.

Mattapex silt loam is medium in natural fertility and is strongly acid. Runoff is very slow. Internal drainage is medium to slow, and the moisture-supplying capacity is medium to high. Water and roots easily penetrate the soil, but in wet seasons a high water table restricts movement of air in the lower horizons. Good tilth is easily maintained; tillage can be safely carried on within a medium wide range of moisture content.

Use and management: Most of the acreage is cultivated. Some of it is wooded, some is pastured, and a little is idle. This soil is well suited to the general crops grown in the area and can be used intensively for them. It is not suited to alfalfa, because of the high water table, and it warms a little too slowly to be suitable for early tomatoes and fruit trees.

Good yields of corn and soybeans can be obtained if adequate amounts of fertilizer and lime are used and other management is good. Artificial drainage may be needed for some vegetable crops and fruit trees. (Capability unit IIw–1.)

Mixed alluvial land (Mx).—This land type occurs throughout the two-county area and is associated principally with the Steep and Sloping sandy lands. It consists of soil material that has been recently deposited along small fresh-water streams and drainageways. Areas of Mixed alluvial land are usually narrow, average less than 300 feet in width, and extend from near the heads of drainageways to the tidal marshes. This mixed alluvial material is highly variable; it ranges from rather coarse sand to silty clay. It is poorly drained and has little agricultural use. Practically all of the acreage is woodland.

The vegetation consists mainly of gum, beech, white and red oaks, red maple, and scattered pine. The low parts of several areas have some cypress. The undergrowth is usually dense, and it consists mainly of smilax, honeysuckle, blackberry, swamp grasses, skunkcabbage, wild onion, and fern. (Capability unit VIw–1.)

Othello silt loam (0 to 2 percent slopes) (Ot).—This poorly drained soil occurs on broad, flat areas of neckland and has formed in marine deposits consisting mainly of sand, silt, and clay. Othello silt loam is a member of the catena that includes the well drained Matapeake, the moderately well drained Mattapex, and the somewhat poorly drained Bertie soils. It is associated with the coarser textured Fallsington and Dragston soils, and with the finer textured Elkton soils. Othello silt loam is more poorly drained than the Dragston soils, and it has the same natural drainage and color range as the Fallsington and Elkton soils. The native vegetation was mostly hardwoods.

Profile in a forest of pine and mixed hardwoods (Northumberland County; near Ophelia, ¼ mile north of Route 649 on Route 687, at the end of cottage area near the Potomac River):

A_0 1 inch to 0, partially decayed, nearly black twigs, hardwood leaves, and pine needles held in mat of fine roots.

A_1 0 to 2 inches, very dark grayish-brown (10YR 3/2), friable silt loam; moderate, medium and fine, granular structure; many fine, medium, and coarse roots; clear, smooth boundary.

A_2 2 to 6 inches, gray (10YR 5/1), friable silt loam; many, medium, distinct mottles of yellowish brown (10YR 5/8) and strong brown (7.5YR 5/8); moderate, medium, granular structure; many fine and medium roots; gradual, smooth boundary.

B_2 6 to 27 inches, gray to light-gray (10YR 6/1) silty clay loam; many, medium and coarse, distinct mottles of yellowish brown (10YR 5/8) and strong brown (7.5YR 5/8); slightly plastic to plastic; moderate, medium, subangular blocky structure; many fine and medium roots; few fine pores; gradual, wavy boundary.

B_3 27 to 35 inches, gray (10YR 5/1), friable, light fine sandy clay loam; few, medium, distinct mottles of yellowish brown (10YR 5/8); weak, medium, subangular blocky structure; occasional, fine, rounded quartz pebbles; clear, wavy boundary.

C 35 to 55 inches, light brownish-gray (10YR 6/2), loose sand with streaks of white and dark grayish-brown loamy sand.

Range in characteristics: The surface layer ranges from a very fine sandy loam to silt loam, but it is mainly silt loam. The subsoil ranges from silty clay loam to heavy sandy clay loam. Thin lenses of more sandy material may also be in the subsoil. This layer is usually underlain by sand and loamy sand at a depth that ranges from about 24 to 42 inches. Strata of finer textured material may also be in the subsoil.

This soil is strongly to very strongly acid, and medium in natural fertility. It is moderately to slowly permeable. Internal drainage is very slow because of the high water table.

Use and management: Most of this soil is forested. The rest is cropped, pastured, or idle. In its natural condition, the soil is best suited to forest. If properly drained, the soil is fairly easy to work and is fairly productive of many general crops grown in the area. Fair to good yields of corn and soybeans can be obtained. With a minimum of drainage, but with good management, pastures consisting of plants adapted to local conditions produce good yields of forage. (Capability unit IIIw-1.)

Rumford loamy sand, gently sloping (2 to 6 percent slopes) (RuB).—This soil occurs mainly as small areas on upland or on the higher terraces that consist of sandy Coastal Plain sediment. It is associated with the Sassafras and Kempsville soils. This soil differs from the Sassafras soils in having a paler and coarser textured surface layer and thinner, coarser textured horizons in the subsoil. It differs from the Kempsville soils in having less distinct horizons in the subsoil and more rapid internal drainage. Subsoil colors are generally more red than those in the Sassafras or Kempsville soils. The native vegetation was mostly hardwoods.

Profile in a cultivated area (Northumberland County; on Route 642, 1¼ miles southeast of Howland, on the Hinton farm):

A_p 0 to 10 inches, brown (10YR 5/3), very friable loamy sand; very weak, fine, granular structure; many fine and medium roots; clear, smooth boundary.

A_3 10 to 16 inches, light yellowish-brown (10YR 6/4) to brownish-yellow (10YR 6/6), very friable loamy sand; weak, fine, granular structure; few fine and medium roots; gradual, smooth boundary. Upper 2 inches has slightly brittle plowsole.

B_2 16 to 22 inches, yellowish-red (5YR 5/6), friable sandy loam; very weak, medium, subangular blocky structure; few fine roots; few fine pores; gradual, irregular boundary.

B_3 22 to 29 inches, strong-brown (7.5YR 5/8), very friable, light sandy loam; weak, fine, granular structure; few fine roots; gradual, wavy boundary.

C 29 to 75 inches, reddish-yellow (7.5YR 7/8), loose loamy sand; single grain; occasional fine roots.

Range in characteristics: The surface layer ranges from 10 to 18 inches in thickness, from light grayish brown to brown, and from loamy fine sand to sandy loam. The subsoil ranges from 12 to 24 inches in thickness, from strong brown to yellowish red, and from sandy loam to light fine sandy clay loam. The latter texture makes up the thin horizons in the subsoil. The loose loamy sand is ordinarily at a depth of about 30 inches from the surface, but depth ranges from 24 to 42 inches.

This soil is low in natural fertility, medium to low in moisture-holding capacity, strongly acid (pH 5.0–5.5), and naturally well drained to excessively drained. It is readily permeable to water, air, and roots. Internal drainage is rapid, workability is excellent to good, and productivity is fair.

Use and management: Most of this soil is cultivated with the adjoining soils. The rest is wooded and pastured. This soil is suited to early market vegetables and melons. Leaching and droughtiness are the main problems. General crops produce only fair yields. (Capability unit IIs-1.)

Rumford loamy sand, sloping, eroded (6 to 10 percent slopes) (RuC2).—This soil differs from Rumford loamy sand, gently sloping, in having steeper slopes and more runoff. It has lost from 25 to 75 percent of the surface layer through erosion. The hazard of erosion is high. Productivity is fair.

Use and management: Most of this soil is wooded, but some is cropped. The rest is pastured or idle. Yields of crops are low.

Workability is excellent, but sand interferes with the use of machinery. The soil is best suited to forestry. Good pastures are hard to maintain on this soil. (Capability unit IIIe-1.)

Rumford loamy sand, thick surface, gently sloping (2 to 10 percent slopes) (RtB).—This soil differs from Rumford loamy sand, gently sloping, in having a thicker surface layer and, in most places, a thinner subsoil. The surface layer is 18 to 30 inches thick; the subsoil, 6 to 18 inches thick.

Use and management: Most of the acreage is wooded. This soil is droughty and leaches readily. It is well suited to early truck crops and melons. General crops produce only fair to poor yields. (Capability unit IIIs-1.)

Sassafras fine sandy loam, nearly level (0 to 2 percent slopes) (SaA).—This moderately deep, well-drained, brown soil has formed in Coastal Plain sediment consisting of sand, silt, and clay (fig. 5). It occurs mainly on broad ridgetops in the high upland. It is associated with the Kempsville and Woodstown soils and with the Sloping and Steep sandy lands. Compared to the Woodstown, it is better drained, but it has similar texture. It is generally brighter colored throughout and lacks the compacted layers of the Kempsville soils. The native vegetation was mainly hardwoods.

Profile in a cultivated area (Northumberland County; Hamlins Corner, Mantua farm):

A_p 0 to 10 inches, brown to dark-brown (7.5YR 4/4), friable fine sandy loam; weak, fine, granular structure; many fine roots; clear, smooth boundary.

B_1 10 to 14 inches, strong-brown (7.5YR 5/6), friable, heavy fine sandy loam; weak, medium, subangular blocky structure; many fine roots; clear, wavy boundary.

B_2 14 to 33 inches, strong-brown (7.5YR 5/6), friable, light fine sandy clay loam; weak, medium, subangular blocky structure; few fine roots; few fine pores; clear, wavy boundary.

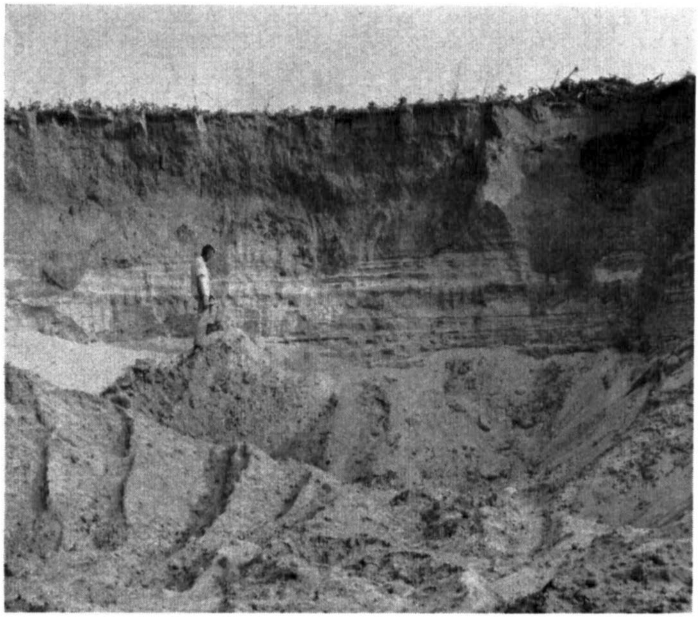

***Figure 5.*—The profile of Sassafras fine sandy loam, nearly level, underlain by colored strata of sand and loamy sand.**

B_3 33 to 42 inches, strong-brown (7.5YR 5/8), very friable fine sandy loam; weak, fine, subangular blocky structure; occasional fine roots; gradual, wavy boundary.

C 42 to 66 inches, brownish-yellow (10YR 6/8), loose loamy sand streaked with white and brown; single grain.

Range in characteristics: The surface layer ranges from pale brown to dark brown, from fine sandy loam to loam, and from 8 to 16 inches in thickness. The subsoil ranges from strong brown to yellowish red, from fine sandy clay loam to sandy loam, and from 14 to 26 inches in thickness. Sandy sediment is generally at a depth of 30 inches, but the range is from 22 to 42 inches. A few areas of loamy sand too small to map separately are included with this soil.

This soil is medium in natural fertility, high in moisture-holding capacity, and strongly acid (pH 5.0 to 5.5). It is very responsive to management, and many consider it to be the best soil in the two-county area. It is readily permeable to air, water, and roots. Workability is excellent; tillage can be carried on throughout a wide range of moisture conditions.

Use and management: Most of this soil is cultivated. However, several large areas and most areas on narrow ridgetops are forested. A small area is pastured or idle.

This soil is suited to many kinds of crops. Productivity can be maintained under intensive cropping through the application of adequate lime and fertilizer and other suitable management. (Capability unit I–1.)

Sassafras fine sandy loam, gently sloping (2 to 6 percent slopes) (SaB).—This soil differs from Sassafras fine sandy loam, nearly level, in having more slope, a more variable texture in the surface layer, a slightly shallower profile, and more runoff. Water-absorbing qualities are good, but the moisture-supplying capacity is not so good as in the nearly level phase of Sassafras fine sandy loam.

Use and management: Most of this soil is cultivated. The rest is pastured, idle, or wooded. Trees grow on most of the narrower ridgetops, which would provide only small, narrow, or irregular fields if they were cleared for cultivation.

This soil is suited to many kinds of crops. Productivity can be maintained by using short crop rotations if other management is good. (Capability unit IIe–1.)

Sassafras fine sandy loam, gently sloping, eroded (2 to 6 percent slopes) (SaB2).—This soil differs from Sassafras fine sandy loam, gently sloping, in having lost from 25 percent to 75 percent of the surface layer through erosion. In addition, it has a shallower surface layer, which, in many places, is somewhat more sandy and holds less moisture available for plant growth. Runoff is slow to medium, and only a few areas have lost more than half of the surface layer.

Use and management: Most of this soil is cultivated, but some large areas are wooded. The rest is pastured and idle.

This soil is suited to many kinds of crops. Productivity can be maintained by growing crops in short rotations, using adequate lime and fertilizer, and applying good management. (Capability unit IIe–1.)

Sassafras fine sandy loam, sloping, eroded (6 to 10 percent slopes) (SaC2).—This soil differs from Sassafras fine sandy loam, gently sloping, eroded, in having steeper slopes. Surface runoff is medium. Productivity is only fair.

Use and management: Most of the acreage is wooded. The rest is cropped and pastured. Intensive management is needed to protect cultivated areas from erosion.

This soil is best suited to permanent sod. The larger cleared areas are often pastured. Yields of forage are fair to good if management is appropriate and adequate amounts of lime and fertilizer are applied. (Capability unit IIIe–1.)

Sassafras fine sandy loam, sloping, severely eroded (6 to 10 percent slopes) (SaC3).—This soil differs from Sassafras fine sandy loam, sloping, eroded, in having lost from 75 percent of the surface layer to 25 percent of the subsoil through erosion. The surface layer is highly variable in color and texture. Numerous sand pockets in small areas make tillage difficult. Runoff is rapid, and the water-holding capacity is low.

Use and management: Much of this soil is cultivated with other soils to square up field boundaries. Yields of crops are low. Erosion can be controlled and difficulty with farm machinery avoided if this soil is kept in permanent sod. The large areas are best suited to permanent pasture and forest. (Capability unit IVe–1.)

Sassafras fine sandy loam, strongly sloping, eroded (10 to 15 percent slopes) (SaD2).—This soil differs from Sassafras fine sandy loam, sloping, eroded, in having steeper slopes. Runoff is rapid. The soil is droughty and has a narrow range of suitability for crops.

Use and management: This soil is best suited to close-growing crops or to trees. Good pasture can be obtained through using adequate amounts of lime and fertilizer, regulating the grazing, and applying other management. Farm machinery is not easily used on this soil. (Capability unit IVe–1.)

Sassafras fine sandy loam, strongly sloping, severely eroded (10 to 15 percent slopes) (SaD3).—This soil differs from Sassafras fine sandy loam, strongly sloping, eroded, in having lost from 75 percent of the surface layer to 25 percent of the subsoil through erosion. Sand pockets are common and make tillage difficult. Runoff is rapid, and the soil is droughty. A few small steep areas are included. Steep slopes interfere with the use of farm machinery.

Use and management: Although some of this soil is cropped, it is best suited to permanent pasture or trees. Intensive management is needed to conserve this soil. (Capability unit VIe-1.)

Sassafras loamy fine sand, thick surface, nearly level (0 to 2 percent slopes) (SfA).—This soil differs from Sassafras fine sandy loam, nearly level, in having a surface horizon that is usually paler, sandier, and from 16 to 24 inches thick. The subsoil may be yellowish brown, is usually somewhat thinner than the surface horizon, and ranges from 12 to 20 inches in thickness.

This soil is in rather large areas and occurs mainly at low elevations. It is associated with the Woodstown and with other phases of Sassafras soils. It also occurs on the narrower ridgetops of the upland in association with the Steep and Sloping sandy lands.

Use and management: Most of this soil is cultivated and used for general crops. Yields are somewhat lower on this soil than on Sassafras fine sandy loam, nearly level. The deep, light texture of the surface layer causes this soil to be somewhat droughty, especially at seeding time. It warms early in the spring and is well suited to short-season, early vegetables. Some of this soil near Ottoman in Lancaster County is used for vegetables. Frequent applications of fertilizers are needed to maintain high yields. (Capability unit IIs-1.)

Sassafras loamy fine sand, thick surface, gently sloping (2 to 6 percent slopes) (SfB).—This soil differs from Sassafras loamy fine sand, thick surface, nearly level, in having more slope. It is permeable, and very little runoff occurs. It is mainly near the breaks of slopes and on narrow upland ridges.

Use and management: Most of this soil is cultivated. The rest is wooded, pastured, or idle. Productivity for general crops is high if adequate fertilizer is applied and other suitable management is practiced. (Capability unit IIs-1.)

Sloping sandy land (6 to 15 percent slopes) (SsD).—This land type occupies escarpments between Coastal Plain terraces and the milder slopes at the heads of drainageways. It occurs extensively in both counties in close association with Steep sandy land. Sloping sandy land is highly variable and has no characteristic profile development. Some areas have a few deep gullies. Most of this mapping unit is sandy and excessively drained (fig. 6). However, strata ranging from sand to clay and containing layers of ferruginous sandstone and thin layers of fine gravel are common. Seepage spots are also common; most of them occur near the clay and sandstone outcroppings. Occasionally, thin deposits of marl occur. This soil is droughty, strongly to very strongly acid, and low in natural fertility. The native vegetation was mainly hardwood.

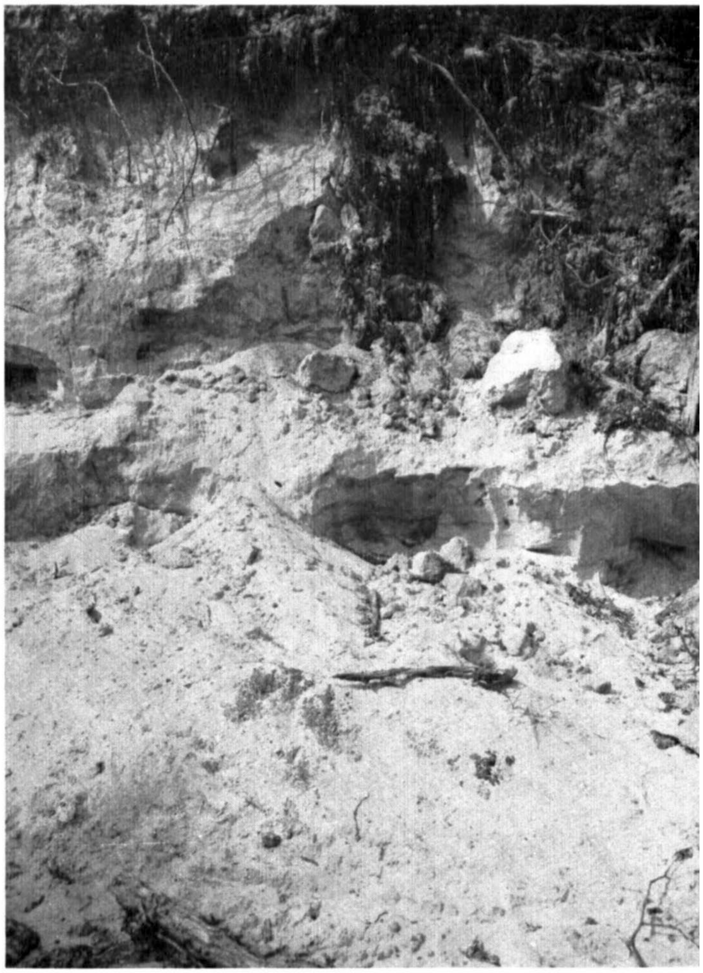

Figure 6.—**The escarpment between marine terraces, occupied by Sloping sandy land, is best suited to trees. Loblolly pine and yellow-poplar grow rapidly on this soil.**

Use and management: Most of this land type is forested, and it is best suited to that use. A few areas have been cleared and are pastured and cultivated in order to square field boundaries. The use of machinery is limited by the slopes and by the sand. Loblolly pine and yellow-poplar grow rapidly on this soil. Pastures need intensive management to produce fair yields. Grazing should be controlled to maintain good stands of forage plants. (Capability unit VIe-2.)

Steep sandy land (15 to 45 percent slopes) (StE).—This mapping unit differs from Sloping sandy land in having stronger slopes.

Use and management: Nearly all the acreage is wooded. The soil is suited only to trees or to the most hardy, drought-resistant varieties of grass. Pine and yellow-poplar trees grow rapidly on this soil. (Capability unit VIIe-2.)

Tidal marsh, high (Th).—This mapping unit is farther inland and at slightly higher elevations than the low phase of Tidal marsh. The soil material is like the fine-textured material of the low phase, but the accumulation of roots, reeds, and grasses is thinner, ranging in thickness from 0 to 6 inches.

Tidal marsh, high, supports a sparse, stunted growth of pine, bayberry, myrtle, and other low-growing shrubs, together with salt-tolerant grasses and reeds. This mapping unit has no agricultural importance. The main use is as a habitat for game and other wildlife. (Capability unit VIIIw-1.)

Tidal marsh, low (To).—This mapping unit is along the banks and at the mouths of creeks and large waterways that flow into the Potomac and Rappahannock Rivers and the Chesapeake Bay. It is covered periodically by tidewater, and, consequently, it supports only salt-tolerant reeds and grasses. Areas of Tidal marsh, low, consist largely of fine-textured material, but sandy material and small sandbars often occur. Accumulations of roots, reeds, and grasses are generally 6 to 24 inches thick.

Tidal marsh, low, has no agricultural significance. It provides a habitat and feeding area for muskrats, raccoons, ducks, and other wildlife. (Capability unit VIIIw-1.)

Woodstown fine sandy loam (0 to 2 percent slopes) (Wo).—This moderately well-drained soil is mainly on the low terraces, or necklands. It has formed in Coastal Plain sediment consisting of sand, silt, and clay. It is the moderately well drained member of the catena that includes the well drained Sassafras, the somewhat poorly drained Dragston, and the poorly drained Fallsington soils. It is associated with the Mattapex and the Bertie soils.

This soil resembles the Sassafras soils in texture but is less well drained. It resembles the Mattapex in color but is coarser textured throughout the profile. It is better drained than the Dragston soils. The native vegetation was mainly hardwoods.

Profile in a cultivated area (Northumberland County; Walnut Point, James Brooks farm.

A_p 0 to 10 inches, brown to dark-brown (10YR 4/3), friable to very friable fine sandy loam; weak, medium and fine, granular structure; many fine roots; clear, smooth boundary.

B_1 10 to 16 inches, light yellowish-brown (10YR 6/4), friable, light fine sandy clay loam; weak, medium, subangular blocky structure; many fine roots; many fine pores; gradual, wavy boundary.

B_2 16 to 29 inches, light yellowish-brown (2.5Y 6/4), friable loam; weak, medium, subangular blocky structure; few fine roots; many fine pores; few, fine, faint grayish mottles in lower part; clear, smooth boundary.

B_3 29 to 34 inches, light olive-brown (2.5Y 5/4), very friable fine sandy loam; few, medium, distinct mottles of gray (2.5Y 5/1) and strong brown (7.5YR 5/8); weak, medium, subangular blocky structure; few fine pores; gradual, wavy boundary.

C 34 to 78 inches, light-gray (2.5Y 7/2), loose sand; pockets of light brownish-gray (10YR 6/2) loamy fine sand; few fine pebbles of quartz; silty clay below depth of 78 inches.

Range in characteristics: In most places this soil is underlain by sand at a depth that ranges from 24 to 42 inches. The surface layer ranges from light grayish brown to brown, and from light fine sandy loam to loam. The subsoil ranges from light yellowish brown to olive brown, and from light fine sandy clay loam to sandy loam. Subsoil colors are somewhat more drab than normal for the Woodstown series but are within the range. A few areas with surface layers 18 to 24 inches thick are included. Also included are a few small areas that have stronger slopes but are otherwise similar.

Woodstown fine sandy loam is medium in natural fertility and is very responsive to management. Runoff is slow, internal drainage is medium to slow, and the moisture-supplying capacity is medium. Plant roots can penetrate easily, but only the mottle-free horizons are aerated in wet seasons. Tilth is easily maintained, and tillage can be safely performed throughout a wide range of moisture content.

Use and management: Most of the acreage is cultivated. For the most part, the rest is wooded or in pasture. Little of this soil is idle. This soil is well suited to the general crops grown in the area, but not to alfalfa. Adequate applications of lime and fertilizer are needed for good yields of general crops.

This soil can be used intensively if management is good. Drainage may be needed to obtain good yields of some vegetables and of fruit trees. (Capability unit IIw-1.)

General Soil Map

After study of the soils in a locality and the way they are arranged, it is possible to make a general map that shows the main patterns of soils. Such a map is the colored soil map in the back of this report. The general soil areas on this map are also called soil associations. Each kind of general soil area, or association, as a rule, contains a few major soils and several minor soils, in a pattern that is characteristic, although not strictly uniform.

The soils within any one association are likely to differ greatly among themselves in some properties; for example, slope, depth, stoniness, or natural drainage. Thus, the general soil map does not show the kind of soil at any particular place, but patterns of soils, each of which may contain several different soils.

The soil associations are named for the major soil series in them, but, as already noted, soils of other series may also be present. The major soil series of one general soil area may also be present in other areas, but in a different pattern and normally in a different proportion.

The general soil map that shows patterns of soils is useful to people who want a general idea of the soils, who want to compare different parts of a county, or who want to know the possible location of good-sized areas suitable for a certain kind of farming or other land use.

This section describes 10 soil associations in Northumberland and Lancaster Counties. The associations are grouped according to the three main topographic and drainage subdivisions of this area.

Deep, Medium-Textured Soils on Ridges and Variable Sandy Soils on Steep Slopes

1. Sassafras-Sandy land association

Well-drained soils on nearly level to gently sloping broad ridgetops and excessively drained soils on moderately steep to steep side slopes.—This association covers about 50 percent of Northumberland and 40 percent of Lancaster Counties. The Sassafras soils makes up about 45 percent of the association; the Sloping and Steep Sandy lands, 35 percent; Mixed alluvial land, 10 percent; and other soils, 10 percent.

The well-drained Sassafras soils occupy ridgetops and are underlain by sand and loomy sand. Sandy land occupies the side slopes and is excessively drained. Narrow strips of poorly drained Mixed alluvial land occur at the bases of steep slopes along the drainageways. Other soils on ridgetops are the Kempsville, Woodstown, and Beltsville. The Kempsville soils have a slightly compacted layer in the lower subsoil. They have a lighter colored surface layer and a more drab subsoil than the Sassafras soils. The Woodstown soils are moderately well drained and occupy depressions. The moderately well drained Beltsville soils have a fragipan, or impervious horizon, in the subsoil. Small areas of the sandy Rumford soils also occur on ridgetops.

The well-drained soils on the broad ridgetops are used intensively for cultivated crops, a use to which they are well suited. The steep, excessively drained soils on slopes and the poorly drained alluvial lands along drains are almost entirely wooded. Most of the farming consists of growing grain for sale. Most of the harvested grain is sold to local elevators. Considerable part-time farming is practiced.

2. *Sandy land-Sassafras-Mixed alluvial land association*

Excessively drained soils on steep side slopes, well drained soils on narrow ridgetops, and poorly drained alluvial deposits along streams.—This association covers about 10 percent of Northumberland and 15 percent of Lancaster Counties. The Sloping and Steep sandy lands make up about 50 percent of the association; the Sassafras soils, about 25 percent; Mixed alluvial land, 15 percent; the Kempsville soils, 5 percent; and other soils, 5 percent.

Four parts of this association are in Northumberland County. The largest of these is located at the upper end of the Great Wicomico River. Another area is located west of Heathsville at the head of the Coan River. Two small areas are along Route 200 near Wicomico Church. The other areas of this association are in Lancaster County. One of these is along the terrace breaks west of Lively. Another one is east of Lively in the area surrounding the Belwood and McMahon Swamps. The two smallest parts are the terrace breaks near Iberis and at the head of the Eastern Branch of the Corrotoman River.

The Sloping and Steep sandy lands occupy the steep slopes (fig. 7). The well-drained Sassafras soils occupy the narrow ridgetops. Narrow strips of poorly drained alluvial deposits are at the bases of slopes and along streams. Other soils that occur mainly on ridgetops are the Kempsville, Beltsville, Woodstown, Mattapex, and Caroline. The Kempsville and Beltsville soils have a lighter colored surface layer than the Sassafras, and they have a compacted layer in the subsoil. The Woodstown and Mattapex soils are moderately well drained and generally occupy small depressions. The Caroline soils have a moderately fine textured surface layer underlain by strata of fine-textured material, and they generally occur on points near terrace breaks.

Most of this association is in forest, the use to which it is best suited. A few of the ridgetops have been cleared to make small fields of irregular shape. Most of the cleared areas are in cultivation.

3. *Beltsville-Kempsville association*

Moderately well drained to well drained soils with fragipans, or compacted subsoil horizons, on high terraces.—This association covers about 3 percent of Northumberland County and 2 percent of Lancaster County. The Beltsville soils make up about 40 percent of the association; the Kempsville, 35 percent; the Sassafras, 10 percent; mixed sandy land, 10 percent; and other soils, 5 percent.

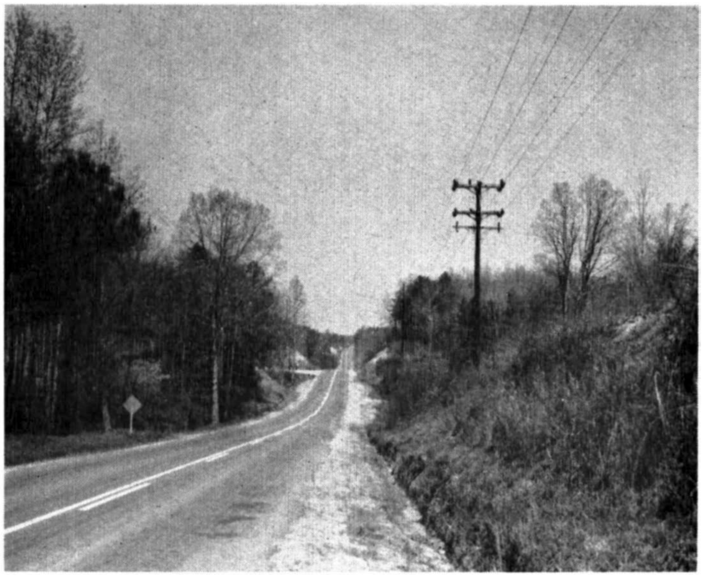

Figure 7.—**Sandy land-Sassafras-Mixed alluvial land association. Sandy land is on the steep slopes; the Sassafras soils are on narrow, irregular ridgetops.**

Three small parts of this association are in Northumberland County. One of these surrounds Callao; another is in the vicinity of Browns Store; the third is near Regina. The two small areas in Lancaster County are continuations of those near Browns Store and Regina.

This association is made up of broad, level to gently sloping ridgetops that are cut irregularly by moderately steep walled drains. The surface soil is dominantly very fine sandy loam, but it ranges from fine sandy loam to silt loam.

The Beltsville and Kempsville soils occupy the level to undulating ridgetops. The Beltsville soils have an impervious fragipan at a depth of about 24 inches and are moderately well drained. They are miry when wet and very droughty in the summer. The Kempsville are well drained but have a compacted layer in the lower subsoil and may have a fragipan deep in the profile. Other soils on the ridgetops are the Sassafras, Bertie, Mattapex, and Woodstown. The Sassafras are well drained and usually occupy the narrow points close to areas of sandy land. The Bertie are somewhat poorly drained and have moderately fine texture. The Woodstown and Mattapex are moderately well drained soils and occur mainly in small depressions. Sandy land occurs on moderately steep slopes and as narrow bands along areas of poorly drained Mixed alluvial land.

This association is about evenly divided between cropland and forest. A large part of the Kempsville soils is used intensively for cultivated crops, a use to which they are well suited. The Beltsville soils are better suited to pasture. Farms on this area are generally small. Operators generally grow and sell grain as a source of cash.

4. Kempsville-Sassafras-Sandy land association

Well-drained soils on ridgetops, well-drained soils with compacted horizons in the subsoil, and excessively drained soils on side slopes.—This association covers 1 percent of Northumberland County and 2 percent of Lancaster County. The Kempsville soils make up 50 percent of the association; the Sassafras, 20 percent; the Steep and Sloping sandy lands, 20 percent; Mixed alluvial land, 5 percent; and other soils, 5 percent.

In Northumberland County this association occurs in one small area in the vicinity of Lara and Moon Corner. In Lancaster County a small area is along Route 3, west of Kilmarnock.

This association is made up of broad, gently sloping ridgetops and moderately steep and very steep side slopes. The surface soil is mainly fine sandy loam, but the texture ranges to loam.

The well-drained Kempsville and Sassafras soils occupy gently sloping ridgetops; sandy land occurs on moderately steep to very steep side slopes. The Kempsville soils have a lighter colored surface layer and a more yellow subsoil than the Sassafras. Slightly compacted layers occur in the lower subsoil of the Kempsville. Other soils on the ridgetops are the Beltsville, Woodstown, Mattapex, and Caroline. Also included are narrow strips of poorly drained Mixed alluvial land.

A large part of this association is wooded. The rest has been cleared and is in cultivation or used for pasture. Farms in this area are small. Operators generally grow grain for sale.

Nearly Level Soils of Variable Texture and Drainage in Broad, Flat Areas Along Coastal Bays

5. Woodstown-Dragston association

Moderately well drained and somewhat poorly drained, moderately sandy soils on broad, flat, low neckland.—This association covers 10 percent of Northumberland County and 15 percent of Lancaster County. The Woodstown soils make up 35 percent of the association; the Dragston, 20 percent; the Mattapex, 15 percent; the Steep and Sloping sandy lands, 10 percent; and other soils, 20 percent.

Two large areas of this association are in Northumberland County. One is west of Lewisetta and the Coan River and borders the Potomac River. The other extends from Mill Creek south to the Lancaster County line and borders Chesapeake Bay. Five small areas are in Lancaster County on low terraces near Chesapeake Bay and the Rappahannock River.

A highly mixed pattern of well drained to poorly drained soils occurs in this association. The Woodstown soils are moderately well drained and are underlain by sand and loamy sand. The Dragston soils are somewhat poorly drained and also are underlain by sandy deposits. The surface layer of the Wooodstown and Dragston soils is dominantly a fine sandy loam.

Other soils in the association are the Mattapex, Bertie, Othello, and Fallsington. The moderately well drained Mattapex, the somewhat poorly drained Bertie, and the poorly drained Othello have moderately fine textures. The Fallsington is poorly drained but has the same texture as the Woodstown and Dragston soils. Sandy land is moderately steep and occurs as narrow bands adjoining the streams, tidal creeks, and rivers. Small areas of the well-drained Sassafras and Matapeake soils and of Mixed alluvial land, Tidal marsh, and Coastal beach are also in this association.

The moderately well drained soils are fairly well suited to cultivation and are used intensively for this purpose. The poorly drained soils are mostly wooded. They would need elaborate artificial drainage systems if they were cleared and cultivated. Most farmers grow grain as a source of cash income. A considerable amount of part-time farming is done by fishermen, crabbers, and oystermen.

6. Mattapex-Bertie association

Moderately well drained and somewhat poorly drained, moderately fine textured soils on broad, flat, low neckland.—This association covers 10 percent of Northumberland County and 7.5 percent of Lancaster County. The Mattapex soils make up 35 percent of the association; the Bertie, 25 percent; the Woodstown, 15 percent; the Steep and Sloping sandy lands, 10 percent; and other soils, 15 percent.

Six small areas of this association are in Northumberland County. They are near the Chesapeake Bay and the Potomac River northeast of Mill Creek and the Coan River. Two areas are in Lancaster County. One is south of Kilmarnock on necks that extend into Chesapeake Bay, and a smaller area is along Taylor and Moran Creeks.

A highly mixed pattern of well drained to poorly drained soils occurs in this association. The Mattapex soils occupy moderately well drained positions and the Bertie, the somewhat poorly drained ones. Both soils have mainly a loam or silt loam surface layer that is normally underlain by sandy material.

The Woodstown, Dragston, Fallsington, and Othello soils are also in this association. The moderately well drained Woodstown, the somewhat poorly drained Dragston, and the poorly drained Fallsington are moderately sandy. The poorly drained Othello has a moderately fine texture. Small areas of the well-drained Matapeake and Sassafras soils also occur in this association. The Sloping and Steep sandy lands occur as narrow bands along streams and tidal creeks. Small areas of Tidal marsh and Coastal beach occur along the shore.

The moderately well drained soils are fairly well suited to cultivation and are used intensively for this purpose. The more poorly drained soils are mainly covered by trees. If they were cleared for cultivation, artificial drainage would be required to obtain high yields. Most farming consists of growing grain for sale. Many part-time farmers supplement their income through fishing, oystering, and crabbing.

7. Matapeake-Mattapex association

Well drained and moderately well drained, moderately fine textured soils on broad, flat neckland.—This association covers 7.5 percent of Northumberland County. The Matapeake soils make up 60 percent of the association; the Mattapex, 25 percent; the Bertie, 5 percent; the Steep and Sloping sandy lands, 5 percent; and other soils, 5 percent.

Three small areas of this association are in Northumberland County. The largest of these encircles the Little Wicomico River near Sunnybank. Another area makes up a part of Hull Neck. The third small area is on both sides and near the mouth of the Great Wicomico River. In Lancaster County there are a few areas of the association south of Kilmarnock and east of Route 200, but they are too small to be shown on the general soil map.

This association consists mainly of well drained and moderately well drained soils.

The Matapeake soils occur in the well drained positions; the Mattapex, in moderately well drained places. Both have mainly a silt loam surface soil that is underlain by sandy deposits. The somewhat poorly drained Bertie, the well drained Sassafras, and the moderately well drained Woodstown soils are also in this association. The Woodstown and Sassafras are more sandy than the Matapeake and Mattapex; the Bertie has a texture similar to that of the Matapeake and Mattapex. Sandy land occurs as steep, narrow bands along drainageways and creek banks. Small areas of Tidal marsh, Coastal beach, and Mixed alluvial land are also in this association.

The large areas of nearly level, well drained and moderately well drained soils are cultivated intensively, a use to which they are well suited. The poorly drained areas are generally small and need artificial drainage before good yields can be obtained. Most farmers grow grain for sale. Many part-time farmers cultivate small tracts and supplement their income through fishing, oystering, and crabbing.

8. Sassafras, thick surface phases-Woodstown association

Excessively drained to moderately well drained, moderately sandy soils of the low terraces, or neckland.—This association covers 10 percent of Lancaster County. The Sassafras, thick surface phases, make up 80 percent of the association; the Woodstown, Sassafras normal phases, the Steep and Sloping sandy lands, and other soils, 20 percent.

All six areas of this association are near the Rappahannock River; they extend from Lancaster Creek to Mosquito Point, and along the Corrotoman River. The association is made up of broad, low, level to undulating areas of neckland. The surface soil is dominantly loamy fine sand and fine sandy loam and is 16 to 30 inches thick.

The thick surface phases of Sassafras soils occupy well drained to somewhat excessively drained positions on the level to gently sloping neckland. They are usually bordered by escarpments or by the Sloping and Steep sandy lands along rivers and creeks. Other soils of the association are the moderately well drained Woodstown, the somewhat poorly drained Dragston, and the normal phases of Sassafras.

Most farms are small. Farmers generally grow grain and sell it as a source of cash. Some of the farmers, however, grow vegetables, which are well suited to these light-textured soils. A large percentage of the operators are part-time farmers who obtain most of their income through fishing, oystering, and crabbing.

Nearly Level, Poorly Drained Soils, Mainly of Fine Texture

9. Othello-Fallsington association

Poorly drained, fine to moderately coarse textured soils on broad, flat neckland.—This association covers 7.5 percent of each of Northumberland and Lancaster Counties. The Othello soils make up 70 percent of the association; the Fallsington, 20 percent; the Elkton and Bladen, 5 percent; and the Bertie, Dragston, and other soils, 5 percent.

Six small areas of this association are in Northumberland County. These are on the lower terraces near the Potomac River and Chesapeake Bay. In Lancaster County are seven small areas, all near the Rappahannock River and Chesapeake Bay.

This association is made up of mainly level, gray, poorly drained soils. Surface-layer textures are mostly silt loam but range to fine sandy loam. Subsoil textures range from clay to fine sandy clay loam or sandy loam.

The Othello soils are moderately fine textured and poorly drained; the Fallsington, poorly drained and moderately coarse textured. Both soils are underlain by sandy substrata. The associated Elkton and Bladen soils are also poorly drained but have fine clayey subsoil and underlying strata. Other soils included in this group are the Bertie, Dragston, and Mattapex. The Bertie and Dragston are better drained than the Othello and Fallsington. The Mattapex is moderately well drained.

This association is predominantly woodland; a few small areas are cultivated. Extensive artificial drainage is needed when these soils are used for crops.

10. Craven-Lenoir association

Fine-textured, moderately well drained and somewhat poorly drained soils on broad to narrow neckland.—This association covers 1 percent of each of Northumberland and Lancaster Counties. The Craven soils make up 45 percent of the association; the Lenoir, 35 percent; the Elkton, 5 percent; the Mattapex, 5 percent; the Bertie, 5 percent; and the Woodstown, Dragston, and other soils, 5 percent.

Only one small area of this association is in Northumberland County. It is along the mouths of the Yeocomico and South Yeocomico Rivers, and includes Mundy Point. Three small parts of the association are in Lancaster County. One of these is south of Deep Creek adjoining the Rappahannock River. Another part is north of Millenbeck on Myer Creek, and the third is south of Moran Creek.

This association occupies neckland that extends into tidal creeks and rivers. The surface soil is predominantly silt loam; the subsoil is plastic silty clay and clay. Under this are strata of clay.

The Craven soils are moderately well drained and occupy narrow points and areas near tidal creeks. The Lenoir soils are somewhat poorly drained and occupy broad, flat neckland. Other soils of this group are the Elkton, Mattapex, Bertie, Woodstown, and Dragston. The poorly drained Elkton soils are fine textured throughout the profile. The moderately well drained Mattapex and Woodstown and the somewhat poorly drained Bertie and Dragston are coarser textured than other soils in the association and generally are underlain by sandy material. Sandy land occurs as steep slopes. Small areas of Tidal marsh are also included in this association.

A large part of this association is wooded; the rest is divided between cropland and pasture. Farms in this area are small, and most of them are operated by part-time farmers who make most of their income from fishing, oystering, and crabbing.

Use and Management of the Soils

This section consists of three parts. The first is a discussion of the general principles of soil management; the second explains how soils are grouped according to their capability and describes the capability units; and the third gives estimated productivity ratings for the soils under two levels of management.

General Principles of Soil Management

The basic management needed to obtain the highest practical yields is similar for all the soils, even though some soils are better suited than others to a specific crop. A discussion of basic management follows.

Rotation of crops

A suitable rotation of crops is needed to obtain high yields, to maintain soil productivity, and to provide the highest income for the owner. Continuous row crops can be grown and high productivity maintained on some soils by only applying fertilizer and returning crop residue. Some soils need cover crops part of the time to maintain high productivity; other soils must be kept in continuous sod if their productivity is to be maintained.

The benefits of a good rotation may be physical, chemical, or biological. Crops differ in their effect on soil granulation or in the amount of organic matter they can supply to improve tilth. Close-growing and sod-forming crops are better suited to holding soil in place and to reducing the hazards of erosion than are the row crops. Crop residue turned under helps to increase the water- and nutrient-holding capacity of the soil. Legumes in the rotation are capable of fixing large quantities of nitrogen from the atmosphere, which can be used by the crops that follow in the rotation. Good rotations are also a factor in the control of weeds, diseases, and insects.

A good farm management plan is not complete until it has been determined if the soil can be cultivated and what kind of management is needed to maintain high productivity. This requires knowledge of how the soil will react to continuous cultivation for row crops and for combinations of row crops, sod-forming crops, and close-growing crops. Some soils are better suited to rotations of crops; others are better suited to continuous sod. Only a few soils are suited to continuous row crops.

Fertilization

Crops should grow rapidly if they are to help maintain and protect the soil. Consequently, nutrients not in the soil should be supplied for the crops that are grown.

Lime is important in soil management because it supplies calcium and, by neutralizing acidity, reduces the solubility of elements that are toxic to plants. In addition, lime increases the availability of phosphorus and other elements, and it increases the activity of desirable bacteria in the soil.

Sandy soil needs less lime than fine-textured soil but needs it more frequently. The soils of Northumberland and Lancaster Counties need about 1 to 5 tons of ground limestone per acre, applied every 4 to 8 years. Lime should be applied only if needed, as too much lime can do more harm than too little (*12*).

In addition to lime, the soils of Northumberland and Lancaster Counties need nitrogen, phosphate, potash, and, in some cases, boron. These nutrient elements, and lime, should be applied according to the needs of the soil and the crop to be grown. A soil test helps show the need for lime. Legumes fix their own nitrogen and generally do not need applied nitrogen. Alfalfa and some vegetable crops need boron.

Soils vary greatly in their response to fertilizer and should be fertilized according to their potential. For example, corn on a soil that has a capacity to produce 100 bushels should be fertilized much heavier than corn on a soil that is capable of producing only 40 bushels. Additional information on soil tests and fertilization is available from the county agricultural agent.

Supporting practices

Proper management requires the use of lime and fertilizer, rotation of crops, and in addition good tillage, artificial drainage, the use of winter cover crops following the harvest of row crops, and contour cultivation and stripcropping on slopes where practical.

Most of the soils of Northumberland and Lancaster Counties are easily worked if they contain the right amount of moisture. Plowing or tilling soil that is too wet or too dry destroys the natural structure and results in cloddiness. Continued use of heavy machinery on wet soil may cause compaction, especially at the boundary between the surface layer and subsoil. Compaction reduces the permeability of soil to moisture and air, and it restricts the growth of roots. Proper tilth can be easily maintained by working the soil when it contains the right amount of moisture and by growing sod-forming and deep-rooted crops in a rotation with other crops.

Extensive artificial drainage is needed on about 15 percent of the acreage of the soils now in cultivation. Needing drainage are the poorly drained and somewhat poorly drained soils and those with slowly permeable subsoil. Good artificial drainage is hard to establish in soils that occupy extremely low, broad, flat areas.

Open-ditch or tile drainage systems can be used. In either case, the system should be designed by an engineer. Cost of installation is generally the limiting factor for most landowners. Shallow strata of sand in some soils may clog either type of drainage system. Additional information about artificial drainage is given in the section "Engineering Properties of the Soils."

Winter cover crops, contour cultivation, and stripcropping are also needed for the conservation of soil and moisture. Because of short, complex slopes, only a few strongly sloping areas are well suited to contour cultivation and stripcropping.

Capability Groups of Soils

The capability classification is a grouping of soils that shows, in a general way, how suitable they are for most kinds of farming. It is a practical grouping based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment.

In this system all the kinds of soil are grouped at three levels, the capability class, subclass, and unit. The eight capability classes in the broadest grouping are designated by Roman numerals I through VIII. In class I are the soils that have few limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations. In class VIII are soils and landforms so rough, shallow, or otherwise limited that they do not produce worthwhile yields of crops, forage, or wood products.

The subclasses indicate major kinds of limitations within the classes. Within most of the classes there can be up to four subclasses. The subclass is indicated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* means that water in or on the soil will interfere with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c* used in only some parts of the country, indicates that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few or no limitations. Class V can contain, at the most, only subclasses *w*, *s*, and *c*, because the soils in it have little or no susceptibility to erosion but have other limitations that limit their use largely to pasture, range, woodland, or wildlife.

Within the subclasses are the capability units, which are groups of soils enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping of soils for making statements about their management. Capability units are generally identified by numbers assigned locally, for example, IIe-1 or IIIw-2.

Soils are classified in capability classes, subclasses, and units in accordance with the degree and kind of their permanent limitations; but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soil; and without consideration of possible but unlikely major reclamation projects.

The capability classes, subclasses, and units in this county are described in the list that follows. In this list, the drainage mentioned is the natural drainage of the soil. Class V is not shown in the list, because no soils of this class occur in Northumberland and Lancaster Counties.

Class I. Soils that have few limitations that restrict their use.
    Capability unit I-1: Nearly level, well-drained, moderately deep soils with loamy subsoil, underlain by sandy material.

Class II. Soils that have some limitations that reduce the choice of plants or require moderate conservation practices.
  Subclass IIe.—Soils subject to moderate erosion if not protected.
    Capability unit IIe-1: Gently sloping, well-drained, moderately deep soils with loamy subsoil, underlain by sandy material.
    Capability unit IIe-2: Gently sloping, well drained and moderately well drained soils with medium-textured surface layer and moderately fine to fine textured subsoil.
  Subclass IIw.—Soils that have moderate limitations because of excess water.
    Capability unit IIw-1: Nearly level, moderately well drained soils with loamy subsoil and with sandy deeper layers.
    Capability unit IIw-2: Nearly level, somewhat poorly drained soils with medium-textured surface layer and subsoil, underlain by sandy material.
    Capability unit IIw-3: Nearly level, moderately well drained soils with moderately fine textured surface layer and fine textured subsoil.
  Subclass IIs.—Soils that have moderate limitations of moisture capacity or tilth.
    Capability unit IIs-1: Nearly level to gently sloping, well drained to somewhat excessively drained soils that are moderately coarse textured.

Class III. Soils that have severe limitations that reduce the choice of plants, or that require special conservation practices, or both.
  Subclass IIIe.—Soils subject to severe erosion if they are cultivated and not protected.
    Capability unit IIIe-1: Gently sloping to sloping, well-drained, moderately eroded soils with medium-textured surface layer and subsoil.
  Subclass IIIw.—Soils that have severe limitations because of excess water.
    Capability unit IIIw-1: Nearly level, poorly drained soils with medium-textured surface layer and subsoil, underlain by sandy material.
    Capability unit IIIw-2: Nearly level, poorly drained and somewhat poorly drained soils with medium-textured surface layer and fine-textured subsoil, underlain by clayey material.
  Subclass IIIs.—Soils that have severe limitations of moisture capacity or tilth.
    Capability unit IIIs-1: Gently sloping to sloping, somewhat excessively drained soils with sandy surface layer and sandy to moderately sandy subsoil.
    Capability unit IIIs-2: Nearly level to gently sloping, moderately well drained soils with medium-textured surface layer and subsoil and with impervious fragipan in the subsoil.

Class IV. Soils that have very severe limitations that restrict the choice of plants, require very careful management, or both.
  Subclass IVe.—Soils subject to very severe erosion if they are cultivated and not protected.
    Capability unit IVe-1: Sloping, well drained and moderately well drained, eroded soils.

Class VI. Soils that have severe limitations that make them generally unsuitable for cultivation and that limit their use largely to pasture or range, woodland, or wildlife food and cover.
  Subclass VIe.—Soils severely limited, chiefly by risk of erosion if protective cover is not maintained.
    Capability unit VIe-1: Sloping to strongly sloping, well-drained, severely eroded soils.
    Capability unit VIe-2: Sloping, somewhat excessively drained sandy land.
  Subclass VIw.—Soils severely limited by excess water and generally unsuitable for cultivation.
    Capability unit VIw-1: Level to nearly level, permanently wet land, not suited to cultivation.

Class VII. Soils that have very severe limitations that make them unsuitable for cultivation without major reclamation, and that restrict their use largely to grazing, woodland, or wildlife.
  - Subclass VIIe.—Soils very severely limited, chiefly by risk of erosion if protective cover is not maintained.
    - Capability unit VIIe–1: Strongly sloping, well drained and moderately well drained, severely eroded soils with slowly permeable subsoil.
    - Capability unit VIIe–2: Steep, somewhat excessively drained sandy land.

Class VIII. Soils and landforms that have limitations that preclude their use, without major reclamation, for commercial production of plants; and restrict their use to recreation, wildlife, water supply, or esthetic purposes.
  - Subclass VIIIw.—Extremely wet or marshy land.
    - Capability unit VIIIw–1: Miscellaneous land types, unsuited to agriculture or to the production of timber.

Management by capability units

This section describes the capability units and suggests how the soils in each unit can be used and managed.

CAPABILITY UNIT I–1

This capability unit consists of nearly level, well-drained, moderately deep soils with loamy subsoil, underlain by sandy material. The soils in this unit are—

Kempsville fine sandy loam, nearly level.
Matapeake silt loam, nearly level.
Sassafras fine sandy loam, nearly level.

These are the best agricultural soils in the two-county area. They are moderately permeable, have a deep root zone, and are underlain by sandy substrata at a depth that ranges from 30 to 40 inches. In addition, they are well drained, are easily worked, and have a moderately high capacity to hold moisture plants can use. The soils are medium to low in natural fertility, moderately low in organic matter, and strongly acid. They are highly responsive to proper treatment with lime, nitrogen, phosphate, potash, and, for some crops, boron. Most of the rainfall is absorbed; runoff is not a hazard.

These soils are suited to intensive cropping, and most of the acreage is cultivated. The chief crops are corn, soybeans, small grains, and tomatoes, the kinds of crops to which the soils are well suited.

These soils, especially the Matapeake, are favored for corn because they have greater capacity to supply moisture corn needs during the growing season. All the soils are suited to alfalfa. However, stands of alfalfa are shorter lived on the Kempsville because air and moisture are less favorable in the lower subsoil than in the other soils of this unit. The coarse-textured Sassafras soil is better suited to early truck crops than the Matapeake and Kempsville soils. All soils in the unit can be maintained at high productivity under continuous use for row crops if adequate fertilization and good cultural practices are followed.

CAPABILITY UNIT IIe–1

This capability unit consists of gently sloping, well-drained, moderately deep soils with loamy subsoil, underlain by sandy material. The soils in this unit are—

Kempsville fine sandy loam, gently sloping.
Kempsville fine sandy loam, gently sloping, eroded.
Matapeake silt loam, gently sloping.
Matapeake silt loam, gently sloping, eroded.
Sassafras fine sandy loam, gently sloping.
Sassafras fine sandy loam, gently sloping, eroded.

These soils are subject to slight runoff and low erosion hazards. They are moderately permeable and have a moderately high capacity to hold moisture plants can use. There is more runoff from these soils than from those in capability unit I–1. The response of crops to fertilization is less because plants have less moisture for growth. If enough rain is properly distributed throughout the growing season and management is good, crop yields from these soils are nearly as high as those from the soils in capability unit I–1.

Most of the acreage is cultivated, but a considerable acreage is wooded. The main crops are corn, soybeans, small grains, and tomatoes (fig. 8). Alfalfa is well suited to these soils if management is good. The compacted horizon in the Kempsville soils limits the growth of alfalfa and shortens the life of stands. Alfalfa on the Kempsville soils must be grown in a mixture with grasses to produce good yields.

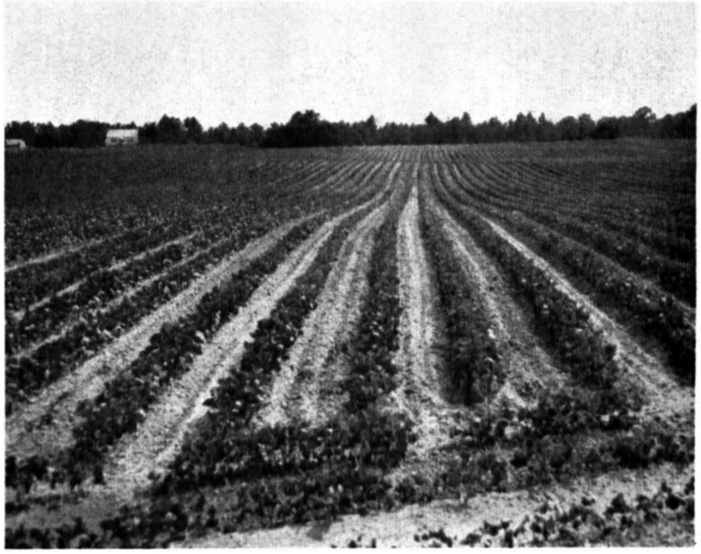

Figure 8.—Sassafras fine sandy loam, gently sloping, is well suited to soybeans and other row crops. Large fields and gentle slopes allow the use of wide farm implements.

The main management problems are control of runoff and maintenance of fertility. Where possible and practical, cover crops and contour farming should be used to protect these soils from erosion and against losses of moisture, organic matter, and fertility during idle periods, when the ground is bare, in the corn to soybean rotation.

CAPABILITY UNIT IIe–2

This capability unit consists of gently sloping, well drained and moderately well drained soils with medium-textured surface layer and moderately fine to fine textured subsoil. In this unit are—

Caroline very fine sandy loam, gently sloping, eroded.
Craven silt loam, gently sloping, eroded.

These soils have mild slopes, but the slowly permeable subsoil causes serious runoff and erosion problems. The surface layer is mainly very fine sandy loam and silt loam, but in places, erosion has exposed small areas of subsoil clay. In these places workability is poor. These soils have a moderate capacity for holding plant nutrients and moisture, but poor aeration in the subsoil limits the growth of plants. Natural fertility is low to medium; the reaction, strongly acid.

Most of the acreage of these soils is covered by slow-growing, scrubby pines and hardwoods. The soils are best suited to permanent pasture and hay consisting of forage plants suited to local growing conditions. Fescue and ladino clover produce fair to good yields if properly fertilized and managed. Most field crops are only fairly well suited to the soils, and their yields are low.

The main management problem is controlling the losses of soil and moisture. Long rotations that keep sod crops on the soils at least two-thirds of the time should be used. Where practical, stripcropping and contour tillage should be used to conserve moisture and control erosion.

CAPABILITY UNIT IIw-1

This capability unit consists of nearly level, moderately well drained soils with loamy subsoil and with sandy deeper layers. The soils in this unit are—

Local alluvial land.
Mattapex silt loam.
Woodstown fine sandy loam.

The Mattapex and Woodstown soils are moderately well drained. Local alluvial land ranges from well drained to moderately well drained. The surface layer of soils in this unit ranges from silt loam to fine sandy loam and is easy to cultivate and to maintain in good tilth. The soils are moderately permeable, are nearly level, and have no erosion hazard. They are moderately low in organic matter, strongly acid, and medium in natural fertility. They are highly responsive to fertilizer and lime. They need little or no artificial drainage for general crops.

These are among the best soils in the area, and they may be cropped intensively. Most of the acreage is cultivated, and the chief crops are corn, soybeans, and small grains. These soils are slightly less well drained than those in capability unit I-1, but in dry years they are more productive of corn and soybeans. Alfalfa is usually shorter lived on these soils than on the Matapeake and Sassafras soils, but it can be grown satisfactorily in short rotations with other crops and in mixtures with grasses. Small grains yield well, but late plantings are damaged more in wet seasons than on the soils of capability unit I-1. Bedding of rows is beneficial for tomatoes and other early truck crops. Small grains often lodge severely on Local alluvial land because of the abundance of plant nutrients and moisture that wash in from surrounding soils. The soils in this capability unit can stay productive when used for continuous row crops if fertilization and management are good.

CAPABILITY UNIT IIw-2

This capability unit consists of nearly level, somewhat poorly drained soils with medium-textured surface layer and subsoil, underlain by sandy material. In this unit are—

Bertie silt loam.
Dragston fine sandy loam.

These soils are moderately wet and are not so well suited to crops as soils that are better drained. In addition, they are low in organic matter, strongly acid, and medium in natural fertility. Because of poor aeration and a somewhat restricted root zone, they are not so responsive to fertilization as the soils with better moisture relations. They are moderately permeable and, except at the extremely low elevations, can be artificially drained rather easily.

About half the acreage is woodland, a use to which the soils are well suited. Most of the rest is used for corn, soybeans, and other general crops commonly grown in the area. A small acreage is in pasture. These soils often stay wet late in spring, and wetness delays planting. Some crops are lost if the soils are too wet for fieldwork during the harvest season.

The yields of corn and soybeans are usually good if these soils are properly managed. Small grains often drown out in low areas. Fescue, ladino clover, and other grasses suited to the soils produce good to excellent yields of forage under good management. Alfalfa and early truck crops are poorly suited to the soils.

Excess moisture is the primary management problem. Some artificial drainage is needed for all the crops commonly grown in the area. Lateral V-type ditches, properly installed, can be used for draining excess water.

CAPABILITY UNIT IIw-3

This capability unit consists of nearly level, moderately well drained soils with moderately fine textured surface layer and fine textured subsoil. The only soil in this unit is—

Craven silt loam, nearly level.

Water, roots, and air cannot readily penetrate the surface layer and subsoil. As a result, roots cannot grow deeply.

The surface layer tends to pack under heavy rains. This soil can be cultivated easily if it contains the right amount of moisture. It clods if cultivated when too wet or too dry.

Most of this soil is cropped or forested. Some of it is pastured, a use to which it is well suited. Grazing should be controlled, especially when the soil is wet. The soil is only fairly well suited to the general crops grown in the area, but it is commonly used for corn, soybeans, and small grains.

The primary management problem is excess moisture. Open-ditch drains can be used to remove the excess water from the low, pocketed areas.

CAPABILITY UNIT IIs-1

This capability unit consists of nearly level to gently sloping, well drained to somewhat excessively drained soils that are moderately coarse textured. The soils in this unit are—

Rumford loamy sand, gently sloping.
Sassafras loamy fine sand, thick surface, nearly level.
Sassafras loamy fine sand, thick surface, gently sloping.

These soils have a sandy surface layer ranging from 16 to 24 inches in thickness and a loamy subsoil that is underlain by sand at a depth of 30 to 40 inches. Supplies of organic matter are low; the reaction is strongly acid. Natural fertility is medium to low, but crops respond quickly to fertilizer and lime. Rainfall is quickly absorbed, and runoff is light. These soils are easy to work and conserve. The subsoil has a moderately high moisture-holding capacity.

Most of the acreage of these soils is used for general crops commonly grown in the area. Some is used for vegetables. A considerable acreage is wooded. Corn and soybeans are fairly well suited to these soils, but yields are generally lower than from the soils in capability unit I–1. However, corn can be planted earlier with less risk of damage from frost because the surface layer warms quickly in spring. Crops planted early have more moisture available for growth and are less likely to be damaged by summer droughts. Crops that are planted in summer and fall may be seeded in dry soil, a condition that makes good stands difficult to establish. The soils in capability unit IIs–1 are especially well suited to early vegetables. Tomatoes, asparagus, greens, and snapbeans are some of the vegetables commonly grown.

The main management problems are the need to conserve moisture and to maintain soil fertility. All crop residue should be turned under, and cover crops grown to increase the moisture-holding capacity and to add organic matter.

CAPABILITY UNIT IIIe–1

This capability unit consists of gently sloping to sloping, well-drained, moderately eroded soils with medium-textured surface layer and subsoil. The soils in this unit are—

Kempsville fine sandy loam, sloping, eroded.
Matapeake silt loam, sloping, eroded.
Rumford loamy sand, sloping, eroded.
Sassafras fine sandy loam, sloping, eroded.

These soils have mild slopes; runoff, permeability, and the hazard of erosion are moderate. These soils are shallower and have more runoff than those in capability unit IIe–1. They also have a lower moisture-holding capacity. Consequently, crops on the soils of capability unit IIIe–1 respond less well to fertilization. These soils are suited to many kinds of crops, but they are somewhat droughty for corn, soybeans, and other crops commonly grown in the area.

The main management problems on these soils are the need to conserve moisture and to control erosion. Close-growing cover crops should be grown most of the time in a long-term rotation with other crops. Where practical, buffer strips and contour cultivation should be used to reduce runoff, conserve water, and save soil.

CAPABILITY UNIT IIIw–1

This capability unit consists of nearly level, poorly drained soils with medium-textured surface layer and subsoil, underlain by sandy material. The soils in this unit are—

Fallsington fine sandy loam.
Othello silt loam.

These soils occur as broad, nearly level areas from which runoff is very slow. The water table is at or near the surface until late in spring and often in summer. Roots grow very little in the early part of the season and generally have not grown enough by midsummer to reach moisture deep in the soil. Consequently, drought often damages crops. Because of the topography and low elevation, artificial drainage is difficult to establish.

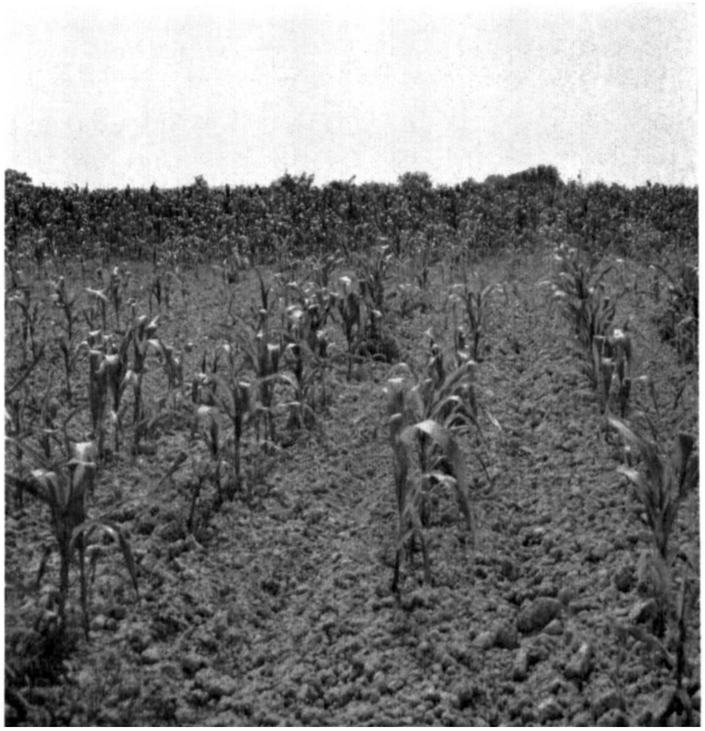

Figure 9.—**Othello silt loam is poorly suited to corn unless drained artificially. Clods are the result of having tilled the soil when it was too wet.**

These soils are medium in natural fertility. Because of the restricted growth of plant roots, crops are not so responsive to fertilization as on soils having better moisture relations.

Most of the acreage of these soils is wooded. The rest is cultivated or pastured. The cultivated areas are used for general crops commonly grown in the area, mainly corn and soybeans. Yields are low (fig. 9). Crop damage and crop losses are heavy on these soils in wet seasons. Forage plants adapted to local conditions make good pasture if adequate amounts of lime and fertilizer are used. Pasture should not be grazed heavily when the soil is wet.

The primary management problem is the need for drainage. Excess water can be drained through the use of V-type ditches. If adequately drained, these soils are easily worked, but tillage and other fieldwork may be delayed longer than on soils that are naturally better drained. Crops grown on these soils require lime and fertilizer in adequate amounts to produce high yields.

CAPABILITY UNIT IIIw–2

This capability unit consists of nearly level, poorly drained and somewhat poorly drained soils with medium-textured surface layer and fine-textured subsoil, underlain by clayey material. In this unit are—

Bladen silt loam.
Elkton silt loam.
Lenoir silt loam.

Because of fine-textured subsoil, the rates of infiltration and percolation are very slow. Runoff is also very slow because of the nearly level topography. The water table is at or near the surface except in dry seasons. These soils can be worked if the moisture is right, but they form clods if worked when too wet or too dry. They are very strongly acid and medium in natural fertility. Because of the shallow root zone, they are not so responsive to fertilization as are the soils with better natural drainage. Poor drainage restricts the agricultural use of these soils.

Most of the acreage is wooded. The rest is cultivated or pastured. Yields of crops are generally low. In addition, crops are damaged or lost because wet soil interferes with fieldwork. Forage plants suited to wet soil make good pasture and hay. Pasture should not be grazed when the soil is wet.

The primary management problem is the need for drainage. Good artificial drainage is hard to establish because of the very slowly permeable subsoil. The removal of excess moisture is essential if good pasture and high yields of crops are expected. This can be done by constructing V-type ditches.

CAPABILITY UNIT IIIs-1

This capability unit consists of gently sloping to sloping, somewhat excessively drained soils with sandy surface layer and sandy to moderately sandy subsoil. Soils in this unit are—

Lakeland loamy fine sand, gently sloping.
Rumford loamy sand, thick surface, gently sloping.

These soils have mild slopes and very little runoff and erosion. They are low in natural fertility and moisture-holding capacity and are rapidly permeable. They are the least fertile soils in the two-county area and are only fairly well suited to general crops. They are easily worked, but their loose, sandy nature often interferes with the operation of farm machinery.

Most of the acreage is wooded. Several areas are cultivated with the adjoining soils. Yields of general crops are only fair; the soils are best suited to melons and early truck crops. Pastures consisting of bermudagrass and other deep-rooted, drought-resistant grasses are fairly good on these soils.

The principal management problem is controlling the loss of moisture and plant nutrients. Sod-forming crops should be included in crop rotations. Crop residue turned under tends to increase the moisture- and nutrient-holding capacity. Crops on these soils respond better to small but frequent applications of fertilizer than do those on soils of finer texture. Because of rapid leaching and comparatively low base-exchange capacity, lime should be applied frequently in small amounts.

CAPABILITY UNIT IIIs-2

This capability unit consists of nearly level to gently sloping, moderately well drained soils with medium-textured surface layer and subsoil and with impervious fragipan in the subsoil. The soils in this unit are—

Beltsville very fine sandy loam, nearly level.
Beltsville very fine sandy loam, gently sloping.
Beltsville very fine sandy loam, gently sloping, eroded.

These soils have a moderately permeable surface layer, but a fragipan at the depth of 20 to 24 inches interferes with the penetration of water, air, and roots. Because of the fragipan, the soils are wet, and planting is often delayed until late in spring. Runoff and erosion are slight on the nearly level soils but are moderate on the gently sloping soils.

The soils are strongly acid, medium to low in natural fertility, and low in moisture-holding capacity. They are not so responsive to fertilization as are the Sassafras and the Kempsville soils. Crops are easily damaged by drought. If the moisture is right, the soils are easily worked. However, wet, miry soil often interferes with tillage and harvest and causes the losses of crops to be high.

The soils are only fairly well suited to general crops. Yields of corn, soybeans, and other general crops are fairly low. Best suited are small grains and the kinds of forage plants than can grow under local conditions. Alfalfa is poorly suited.

A large acreage is wooded, but trees grow slowly, and windthrow is severe. The main management problem consists of draining excess water from the surface, conserving soil and plant nutrients, and growing crops that are adapted to the soils. Long-term rotations that keep close-growing crops on the soils most of the time are best suited. Excess water can be removed from the surface by installing V-type ditches. Lime and fertilizer should be applied according to the needs of the soil and the crop to be grown.

CAPABILITY UNIT IVe-1

This capability unit consists of sloping, well drained and moderately well drained, eroded soils. Soils in this unit are—

Caroline very fine sandy loam, sloping, eroded.
Craven silt loam, sloping, eroded.
Kempsville fine sandy loam, sloping, severely eroded.
Matapeake silt loam, strongly sloping, eroded.
Sassafras fine sandy loam, sloping, severely eroded.
Sassafras fine sandy loam, strongly sloping, eroded.

These soils have moderately high rates of runoff and erosion. They are medium in natural fertility, low in organic matter, and strongly acid. The moisture-holding capacity is moderately low. The texture of the surface layer is complex and ranges from rather sandy to moderately clayey. The subsoil of the Caroline and Craven soils is finer textured and is less permeable than that of the Sassafras, Kempsville, and Matapeake soils.

The soils in this unit are best suited to hay and pasture consisting of forage plants that can grow under local conditions. The soils can also be cultivated occasionally if management is good. The yields of general crops, however, are low because the soils are droughty. Buffer strips and contour farming should be used in cultivated fields to reduce runoff and to control erosion.

CAPABILITY UNIT VIe-1

This capability unit consists of sloping to strongly sloping, well-drained, severely eroded soils. The soils in this unit are—

Caroline clay loam, sloping, severely eroded.
Sassafras fine sandy loam, strongly sloping, severely eroded.

These soils are subject to high rates of runoff and erosion. They are medium in natural fertility and low to moderately low in moisture-holding capacity. The texture of the surface layer is complex and ranges from rather sandy to clayey. In this unit the Sassafras soil is coarser textured throughout than the Caroline soil. Seedbeds are easily prepared on either soil if moisture is right.

These soils are best suited to permanent pasture and trees. Pastures should be limed and fertilized properly and the grazing controlled to maintain sod in good condition. These soils are very poorly suited to cultivation; strong slopes limit the use of farm machinery. A few small areas, however, are cultivated with adjoining better soils to straighten field boundaries.

CAPABILITY UNIT VIe-2

This capability unit consists of sloping, somewhat excessively drained sandy land. The only mapping unit is—

Sloping sandy land.

Included with the sand is stratified material that ranges from sand to clay and a few outcrops of gravel and ferruginous sandstone. All of this material is generally excessively drained, low in fertility, very droughty, and strongly to very strongly acid. Seepage spots, which generally originate on top of the strata of clay and sandstone, are common.

Because it is sloping and sandy, this land type is poorly suited to cultivation and to use of farm machinery. Most of the acreage is used as woodland, the use to which this mapping unit is best suited. Loblolly pine and yellow-poplar grow well. A few small areas are cultivated with the better adjoining soils to shape field boundaries. Cultivated areas should be protected from erosion. Yields of general crops are extremely poor. Pasture on this land type requires careful management if fair yields of forage are to be obtained.

CAPABILITY UNIT VIw-1

The capability unit consists of level to nearly level, permanently wet land not suited to cultivation. The only mapping unit is—

Mixed alluvial land.

This permanently wet land type occurs along small streams and consists of recently deposited soil material. The texture is highly variable and ranges from rather coarse sand to silty clay.

Nearly all the acreage is wooded, mainly with gum, beech, white and black oaks, red maple, and occasionally scattered pines. Under the trees is a dense growth of smilax, swamp grass, fern, and other plants that can tolerate wetness. The soil is well suited to loblolly pine, which grows rapidly but is extremely difficult to establish. Forage plants that are adapted to the predominantly wet condition of this land type can be grown for pasture, but they are difficult to establish and to maintain because of the competition from native weeds and shrubs. Wetness limits the use of farm machinery.

CAPABILITY UNIT VIIe-1

This capability unit consists of strongly sloping, well drained and moderately well drained, severely eroded soils with slowly permeable subsoil. The soils in this unit are—

Caroline clay loam, strongly sloping, severely eroded.
Craven clay loam, strongly sloping, severely eroded.

These soils have a clayey subsoil and are slowly permeable. Runoff is rapid, and the hazard of erosion is high. The available moisture-holding capacity is low. Workability is poor. Seedbeds can be prepared only when the moisture is right.

These soils are suited only to permanent pasture or to trees. Forage plants that are adapted to local conditions should be used for pasture. Good yields of forage can be obtained through adding proper amounts of lime and fertilizer and carefully regulating the grazing to maintain a good sod.

Trees grow slowly in these severely eroded soils, but they provide good protection from runoff and erosion. They are often needed most in the narrow, irregularly shaped areas.

CAPABILITY UNIT VIIe-2

This unit consists of steep, somewhat excessively drained sandy land. The only mapping unit is—

Steep sandy land.

This land type is not suited to cultivation and is very poorly suited to pasture. Slopes generally do not allow the use of farm machinery. Nearly all of this land type is in forest, which consists of low-grade hardwoods, yellow-poplar, and pine. Yellow-poplar and loblolly pine are well suited and they grow rapidly. However, good stands are hard to establish because of the steep slopes and the competition from underbush. The expense of hired labor discourages landowners from investing in forest improvement.

CAPABILITY UNIT VIIIw-1

This capability unit consists of miscellaneous land types, unsuited to agriculture or to the production of timber. In it are—

Coastal beach.
Tidal marsh, high.
Tidal marsh, low.

These miscellaneous land types are suitable only as wildlife habitats and recreational sites. Tidal marsh, low, supports a dense growth of marsh grasses and reeds. Tidal marsh, high, supports a sparse growth of salt-tolerant shrubs and an occasional dwarfed pine on the highest areas together with reeds and grasses. Coastal beach supports hardly any vegetation.

Productivity Ratings of the Soils

Productivity ratings for the soils in Northumberland and Lancaster Counties are given in table 6. The productivity rating for each crop grown on a soil is the percentage of the standard yield given at the top of the column for the stated crop. The standard yield is the approximate average yield obtained (without the use of fertilizers or other amendments) on the more productive soils in the United States where the crop is most commonly grown. A productivity rating of 50 for a Northumberland or Lancaster County soil means that the soil is about half as productive of a specified crop as the soil with a standard yield. Soils that have been limed or fertilized or that are unusually productive may have a productivity rating of more than 100 for some crops.

TABLE 6.—*Estimated productivity ratings of soils for crops*

[Ratings in columns A are for ordinary management; those in columns B, for improved management. Absence of data indicates stated crop is not commonly grown or soil is not suited to it]

Soils	Corn (100=50 bushels per acre)		Soybeans (100=25 bushels per acre)		Wheat (100=25 bushels per acre)		Oats (100=50 bushels per acre)		Tomatoes (100=10 tons per acre)		Alfalfa hay (100=4 tons per acre)	
	A	B	A	B	A	B	A	B	A	B	A	B
Beltsville very fine sandy loam, nearly level	80	110	72	96	80	120	90	150	80	100	------	------
Beltsville very fine sandy loam, gently sloping	80	110	72	96	80	120	90	150	80	100	------	------
Beltsville very fine sandy loam, gently sloping, eroded	40	60	40	64	40	64	50	80	------	------	------	------
Bertie silt loam	80	100	64	96	64	104	70	120	70	90	------	------
If artificially drained	100	140	88	112	104	152	90	150	100	140	------	------
Bladen silt loam	------	------	------	------	------	------	------	------	------	------	------	------
If artificially drained	80	120	72	104	80	120	80	140	------	------	------	------
Caroline very fine sandy loam, gently sloping, eroded	70	90	56	88	72	112	70	110	60	80	50	70
Caroline very fine sandy loam, sloping, eroded	40	60	40	64	40	64	40	60	------	------	------	------
Caroline clay loam, sloping, severely eroded	30	50	40	56	40	56	40	50	------	------	------	------
Caroline clay loam, strongly sloping, severely eroded	30	40	24	40	24	32	30	40	------	------	------	------
Craven silt loam, nearly level	80	100	64	96	72	112	90	140	70	90	------	------
Craven silt loam, gently sloping, eroded	70	90	56	88	64	104	70	110	60	80	------	------
Craven silt loam, sloping, eroded	30	50	32	56	32	48	40	70	------	------	------	------
Dragston fine sandy loam	80	100	64	96	64	104	70	120	70	90	------	------
If artificially drained	90	130	88	112	104	152	90	150	120	150	------	------
Elkton silt loam	------	------	------	------	------	------	------	------	------	------	------	------
If artificially drained	80	120	72	104	80	120	80	140	------	------	------	------
Fallsington fine sandy loam	50	70	48	72	56	96	60	90	------	------	------	------
If artificially drained	80	130	80	112	96	144	80	140	100	130	------	------
Kempsville fine sandy loam, nearly level	120	170	104	128	120	160	120	180	130	160	(1)	(1)
Kempsville fine sandy loam, gently sloping	90	140	88	120	112	152	100	160	130	160	(1)	(1)
Kempsville fine sandy loam, gently sloping, eroded	80	110	72	104	72	112	70	120	80	100	(1)	(1)
Kempsville fine sandy loam, sloping, eroded	60	80	48	80	56	96	70	100	70	90	(1)	(1)
Kempsville fine sandy loam, sloping, severely eroded	30	50	32	56	32	48	40	70	------	------	(1)	(1)
Lakeland loamy fine sand, gently sloping	50	70	48	72	48	88	60	90	80	100	------	------
Lenoir silt loam	------	------	------	------	------	------	------	------	------	------	------	------
If drained artificially	80	120	72	104	80	120	80	140	------	------	------	------
Local alluvial land [2]	130	200	112	144	96	136	120	180	120	140	------	------
Matapeake silt loam, nearly level	130	200	112	144	136	176	120	180	140	180	85	110
Matapeake silt loam, gently sloping	110	160	96	120	120	160	120	180	140	180	75	100
Matapeake silt loam, gently sloping, eroded	90	130	84	100	100	140	100	150	110	140	65	85
Matapeake silt loam, sloping, eroded	70	90	56	88	72	112	70	100	80	100	55	75
Matapeake silt loam, strongly sloping, eroded	30	50	32	48	32	48	40	80	50	60	45	60
Mattapex silt loam	120	180	104	136	128	168	110	160	130	160	(1)	(1)
Othello silt loam	50	70	48	72	56	96	60	90	------	------	------	------
If artificially drained	80	130	80	112	96	144	80	140	100	130	------	------
Rumford loamy sand, gently sloping	70	100	64	96	64	104	80	130	80	100	(1)	(1)
Rumford loamy sand, sloping, eroded	40	60	40	64	48	88	50	80	60	80	(1)	(1)
Rumford loamy sand, thick surface, gently sloping	50	70	48	72	48	88	60	90	70	90	------	------
Sassafras fine sandy loam, nearly level	120	180	104	136	128	168	120	180	140	180	75	100
Sassafras fine sandy loam, gently sloping	110	150	96	120	112	160	120	170	140	180	70	90
Sassafras fine sandy loam, gently sloping, eroded	80	110	72	104	72	112	70	120	80	100	50	70
Sassafras fine sandy loam, sloping, eroded	70	90	56	88	72	112	70	100	80	100	50	70
Sassafras fine sandy loam, sloping, severely eroded	60	80	48	80	56	96	60	90	60	70	45	55
Sassafras fine sandy loam, strongly sloping, eroded	30	50	32	48	32	48	40	80	50	70	35	50
Sassafras fine sandy loam, strongly sloping, severely eroded	30	40	24	40	32	40	30	60	------	------	------	------
Sassafras loamy fine sand, thick surface, nearly level	100	150	96	120	96	144	110	170	130	160	(1)	(1)
Sassafras loamy fine sand, thick surface, gently sloping	80	130	80	112	96	136	100	160	130	150	(1)	(1)
Woodstown fine sandy loam	120	170	104	128	128	168	110	170	140	170	(1)	(1)

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[1] Alfalfa suitable only if grown alone in a short crop rotation, if grown with grass in mixed stand, or if grown with grass as part of a crop rotation.

[2] Small grains lodge readily on this soil.

The productivity rating is calculated as follows:

$$\text{Productivity rating} = \frac{\text{Expected yield per acre}}{\text{Standard yield per acre}} \times 100$$

These ratings cannot be interpreted directly into land values, because distance to market and many other factors must be considered. The ratings can be used for comparing yields of specific crops on different soils within these two counties and for comparing soils in Northumberland and Lancaster Counties with those in other parts of the United States for which similar rating have been made.

Most of the data in table 6 were collected by soil scientists in the field at the time of the soil survey. Some ratings are based on data obtained from experiment stations and from farm records. Where sufficient data were not available, yields were obtained by comparison with soil on which data are available, by field observations, and by consultations with farmers, county agricultural agents, and agricultural specialists. New varieties of crops, improvements in cultivation and fertilization practices, and better insect and disease control may change the yield level in the future.

The figures in columns A show the percentage of the standard yield that can be expected under prevailing management. Such management includes use of short rotations of corn and soybeans with or without small grains. Little consideration is given to the use of winter cover crops. Cornstalks and the straw of soybeans and small grains are generally the only organic residue returned to the soil. Moderate quantities of a ready-mixed, complete fertilizer are used, and there is some use of nitrogen as a side dressing or as a top dressing. Lime is used to correct acidity, and a few farmers drill it in the row for soybeans where the soil is too acid in reaction. Alfalfa generally is not grown in rotations with other crops. Differences in fertilization and management account for lower yields in columns A than in columns B.

The figures in columns B show the percentage of the standard yield that may be expected under improved management. A few farmers obtain these yields. However, more farmers could obtain high yields if they applied the practices used by the better farmers. Improved management includes the proper choice and rotation of crops; the correct use of commercial fertilizer, lime, and manure and proper tillage methods; the application of boron and large quantities of phosphate and potash to alfalfa; the return of organic matter to the soil; the best practical methods of controlling weeds and pests; and engineering measures to control water on the land where necessary to maintain or increase soil productivity within practical limits.

The yields in columns B, when compared with those shown in columns A, give some idea of the response crops can be expected to make to good soil management. They may be considered as production goals that can be reached by feasible management practices.

Although knowledge about good management for specific soils planted to certain crops is somewhat limited, some deficiencies in the soils are known and others are considered probable. On this basis, practices of management needed to improve yields can be suggested. Some of the practices needed to obtain the yields listed in columns B are discussed in the section "Management by Capability Units."

Tidal marsh, Mixed alluvial land, and the Steep and Sloping sandy land miscellaneous land types and Craven clay loam, strongly sloping, severely eroded, have been omitted from table 6 because they are not suitable for the production of crops. Several soils listed and identified in the table are suited to crops only if they are artificially drained.

Information regarding crop varieties and fertilization can be obtained from the county agent, from the people in the Soil Conservation Service, or from the State agricultural experiment station.

Use of Soils for Woodland[4]

When the white settlers arrived in the area now known as Northumberland and Lancaster Counties, forests probably covered the land. The trees were mainly hardwoods mixed with scattered pines or with small areas of pine. Pines could establish themselves only in clearings made by fire or by wind. The undisturbed forest was a generally stabilized plant community in which the final stage of development was the climax oak-hickory type of forest.

The settlers quickly cleared large areas of the forest for cultivation. Abandonment of land that had been cleared and farmed began soon after the Civil War and continues even today. This open land is ideal for the establishment of pine. Seed from scattered pines in the surrounding forest blow into the abandoned clearings to establish pure or nearly pure stands of pine. Most of the natural, pure stands of pine in Northumberland and Lancaster Counties are on abandoned fields and are known as old-field stands. Pine was much less abundant in the virgin forest than it is today.

Hardwoods still predominate in the forests of Northumberland and Lancaster Counties. Because they can tolerate shade, hardwoods become established as an understory in stands of pine trees and take over the area when pine is cut. Unless the understory of hardwoods is controlled or eliminated, most of the old-field stands of pine will revert to hardwoods or to mixtures of pines and hardwoods after the old pine trees are harvested.

At present, 60 to 65 percent of the area of Northumberland and Lancaster Counties is in forest. Present forests consist of many different kinds of trees. Most species occur on all the soil types, at least occasionally, and only a few species are restricted to a few soil types. However, many kinds of trees seem to prefer certain soil types and are much more abundant on wet soils than on well-drained soils.

Trees of many kinds are generally abundant on the better drained, medium-textured Sassafras, Woodstown, Kempsville, Matapeake, and Mattapex soils. Loblolly pine (*Pinus taeda*) and Virginia pine (*Pinus virginiana*) are about equally abundant on these soils, but shortleaf pine (*Pinus echinata*) is uncommon. Oak also grows on these soils. The most common are white oak (*Quercus alba*) and southern red oak (*Quercus falcata*). Less common are scarlet oak (*Quercus coccinea*), post oak (*Quercus stellata*), black oak (*Quercus velutina*), and chestnut oak (*Quercus prinus*). Oaks that occasionally grow on these soils are willow oak (*Quercus phellos*), northern red oak (*Quercus rubra*), and blackjack oak (*Quercus marilandica*). The other hardwoods commonly growing on these soils are yellow-poplar (*Liriodendron tulipifera*), hickory (*Carya* spp.), redgum (*Liquidambar styraciflua*), blackgum (*Nyssa sylvatica*), red maple (*Acer rubrum*), and beech (*Fagus grandifolia*). Less common are persimmon (*Diospyros virginiana*), black walnut (*Juglans nigra*), black locust (*Robinia pseudoacacia*), and black cherry (*Prunus serotina*). The understory commonly consists of holly (*Ilex opaca*), dogwood (*Cornus florida*), and a great variety of shrubs. Some of the more common shrubs are mountain-laurel (*Kalmia latifolia*), blueberry (*Vaccinium* spp.), huckleberry (*Gaylussacia* spp.), and waxmyrtle (*Myrica cerifera*).

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[4] Written by THOMAS A. DIERAUF, forester, Virginia Division of Forestry, Tappahannock, Va.

The kinds of trees and shrubs that grow on the more poorly drained soils are different from those on the better drained soils. Loblolly pine is by far the most common pine on the poorly drained soils. Yellow-poplar is less abundant. White oak, southern red oak, redgum, red maple, and blackgum are common. Willow oak is more common on wet soils but is uncommon on the better drained soils. White ash (*Fraxinus americana*), river birch (*Betula nigra*), American elm (*Ulmus americana*), swamp chestnut oak (*Quercus michauxi*), overcup oak (*Quercus lyrata*), pin oak (*Quercus palustris*), and water oak (*Quercus nigra*) grow on wet soils, but they rarely grow on the better drained soils. The understory is often dense on wet soils. Pepperbush (*Clethra alnifolia*) and waxmyrtle are two of the more common plants on wet soils.

Loblolly pine seldom grows where water stands on Mixed alluvial land and poorly drained soils. In these places red maple, blackgum, redgum, willow oak, white ash, river birch, and American elm are the predominant trees. Baldcypress (*Taxodium distichum*) occasionally grows in these "hardwood swamps."

The excessively drained Rumford and Lakeland soils and the slowly permeable Caroline and Beltsville soils are, in effect, very dry soils for trees. On these soils, Virginia pine is usually more abundant than loblolly pine, and white oak and southern red oak are common. In addition, scarlet, post, and blackjack oaks and other so-called dry-site oaks frequently grow on these soils. Yellow-poplar and redgum are less common than on soils having more moisture. The understory is usually sparse on these soils. Various species of blueberry and huckleberry make up most of the understory.

Loblolly pine is the most important, commercially valuable tree in Northumberland and Lancaster Counties. It is used for both lumber and pulpwood. Loblolly pine is more desirable than either Virginia pine or shortleaf pine because it grows faster and is easier to manage. The wood of all three of these pines is equally valuable. Loblolly pine is best grown in even-aged stands. Proper spacing of trees in even-aged stands should be maintained by cutting the slower growing and less desirable trees for pulpwood and other products. Thinnings allow the crop trees to have enough space for rapid growth. When mature, all crop trees except a few good seed trees should be cut. The seed trees are left to start a new stand. Loblolly pine reproduces itself very well naturally if the ground is scarified before seed falls. Control of undesirable hardwoods is nearly always necessary when starting a new stand of loblolly pine.

Yellow-poplar and oak are the most important, commercially valuable hardwoods. The wood of yellow-poplar is as valuable as that of pine, and poplar grows about as fast as pine in the right kind of soil. Yellow-poplar, in many respects, is similar to loblolly pine and may be managed in much the same way. Oak of good quality brings a good price. However, the profits from growing oak are not so great, under present day market, as those from growing loblolly pine or yellow-poplar.

Suitability of Soils for Trees

Many different factors combine to determine the suitability of soils for trees. Among these are the factors that determine the amount of water and air available to tree roots. Soil depth, texture, consistence, structure, and topographic position are the most significant factors in determining availability of water and air. Most trees do not grow well in swampy soils, because aeration is poor. The roots of all trees require a certain amount of oxygen, and some trees require more than others.

Valuable hardwoods, mainly yellow-poplar, white oak, and southern red oak, grow best on deep, friable, moist, well-aerated, medium-textured Sassafras, Woodstown, Matapeake, and Mattapex soils. The lack of air in poorly drained soils evidently is the factor that limits the growth and quality of trees. The light-textured soils are well aerated, but they have a low moisture-holding capacity. Consequently, they too are not so well suited as sites for growing the valuable hardwoods. Hardpan and clay in the subsoil of the Beltsville and Caroline soils restrict root growth and the intake of water; consequently, these soils are poor for hardwoods.

These conditions generally also restrict the growth of pine. However, loblolly pine can make better growth in a wet soil than can the valuable hardwoods. Evidently, loblolly pine needs less oxygen, or its roots can efficiently use the small amount of oxygen in the wet soil. This species of pine makes its best growth in poorly drained soils.

Height of water table and seepage on slopes multiply the problem of determining the suitability of a soil for trees. Very sandy soils that have a very low water-holding capacity may be good for trees if the tree roots can reach a permanent water table. Tree roots can penetrate to great depths in light- and medium-textured soils—depths greater than are usually probed with a soil auger. The excellent growth of trees on Sloping sandy land and Steep sandy land is thought to be due, in part at least, to seepage.

Very little is known of the nutrient requirements of trees. Natural soil fertility undoubtedly is important. However, the research to date on this subject indicates that fertility is not the only factor that influences the growth of trees on most soils. Depth, texture, consistence, and wetness of the soil, which influence aeration and the storage of water, seem to be the real factors that regulate tree growth. Soil productivity affects the growth of trees and their response to management. This quality is fairly easily recognized, and it can be measured.

Like other plants, trees grow more rapidly and produce more wood on some soils than on others. The capacity of soil to produce wood can be measured and described in units per acre, just as the productivity of cropland can be described in bushels per acre. However, wood crops are measured in many different units, and it is, therefore, more convenient to use tree height as the relative measure of a soil's wood-producing ability. The best expression of the productive capacity of forest soil is height of the dominant and codominant trees in a forest. The tallest trees generally grow on the best soil. Under this system, if the height of the dominant and codominant trees at age 50 is 80 feet, the site index, or productivity rating of that soil, is 80. In Northumberland and Lancaster Counties, site indexes range from 60 for the poorest soils to 100 for the best soils.

Volume growth in well-stocked stands is closely correlated with site index, or with the height of the dominant and codominant trees. This is illustrated by table 7, which is adapted from table 53 in the publication "Volume, Yield, and Stand Tables for Second-Growth Southern Pines" (*9*). Trees also grow faster in diameter on the good soils than they do in poor soils. This is particularly true if small and stunted trees are removed to increase the space for the better trees left growing. Consequently, the yield of well-managed forests growing on site-index 100 soils will be considerably more than that of forests growing on poor soils.

TABLE 7.—*Yield of loblolly pine in fully stocked stands, at various ages, in board feet*[1] *per acre for stated values of site*

Age	Site index in feet				
	60	70	80	90	100
	Bd. ft.	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*	*Bd. ft.*
30	4, 500	8, 500	12, 500	17, 000	22, 000
40	10, 000	16, 000	22, 000	28, 500	35, 500
50	15, 000	22, 000	29, 500	37, 500	45, 500
60	19, 000	26, 500	34, 500	43, 000	52, 500

[1] According to the International (⅛-inch) Rule.

Drainage as an Indicator of Productivity

A large amount of data has been collected in Northumberland and Lancaster Counties regarding the productivity of the soils for loblolly pine. This pine is the most important forest tree in the area. Soil moisture, to a large extent, determines the productivity or quality of a soil for loblolly pine. Consequently, drainage is a convenient criterion for grouping soils to determine their productivity for this species. In the following discussion, the soils, together with a tentative site-index rating for loblolly pine, have been grouped on the basis of the degree of natural drainage.

SOMEWHAT EXCESSIVELY DRAINED SOILS

The somewhat excessively drained soils are the Lakeland on high terrace positions, with a site-index, or productivity rating, of 65 to 70; the Lakeland on low terrace positions, 80; Rumford soils, 65 to 70; the Sassafras, thick surface phases, on high terrace positions, 70, and low terrace positions, 80; Sloping sandy land, and Steep sandy land, 80 to 85.

These soils have a low moisture-storage capacity, and they are droughty. Because of this, one might expect all of these soils to be only fair for loblolly pine. However, in low terrace positions, the presence of a water table that is within reach of tree roots compensates for the inherently low water-storage capacity of the soil. In high terrace positions, the water table is deep, and the only source of water for trees is that retained by the soil. Seepage probably supplies the extra moisture that makes Steep sandy land and Sloping sandy land productive for loblolly pine. These steep and sloping sandy lands are also good sites for yellow-poplar, oak, and other hardwoods.

WELL-DRAINED SOILS

The well-drained soils are the Sassafras, Kempsville, and Matapeake, with a site index of 80; and the Caroline, 65.

The Caroline soils have a tight, clayey subsoil and are eroded. They are generally poor for trees of any species.

MODERATELY WELL DRAINED SOILS

The moderately well drained soils are the Woodstown and the Mattapex soils, with a site index of 80 to 85; Craven soils, 80; and Beltsville, 65.

The heavy-textured Craven soils are variable in productivity for loblolly pine. The Beltsville soils have a hardpan that restricts the movement of water and the growth of roots. They are poor for loblolly pine, even though they are imperfectly drained.

SOMEWHAT POORLY DRAINED SOILS

The somewhat poorly drained soils are the Dragston and the Bertie, with a site index of 85 to 90; and the heavy-textured Lenoir, for which site-index ratings cannot be given at this time.

POORLY DRAINED SOILS

The poorly drained soils are the Fallsington, with a site index of 90; Othello, 77; Mixed alluvial land, 90 to 95; and the heavy-textured Elkton and Bladen, for which site-index ratings cannot be given at this time.

The Othello soils are not so good as might be inferred from their poorly drained position in the catena. The somewhat poorly drained Bertie are higher in the catena, but apparently better for loblolly pine than the Othello. Poor aeration may be the limiting factor in the Othello soils, because they are under water late in winter and in spring.

Under present market conditions, loblolly pine is probably the most profitable trees to grow on the soils of Northumberland and Lancaster Counties. On the deep, friable, moist, and well-aerated soils, yellow-poplar may be as profitable as pine. Oak of good quality can also be grown on these soils, but it cannot compete with loblolly pine or yellow-poplar in dollar returns per acre.

Only short, poorly formed, and low-quality hardwoods can be grown on the Lakeland, Rumford, Caroline, and Beltsville soils. Although these soils are poor to fair for loblolly pine, they are much better suited to pines than to hardwoods.

Loblolly pine is the most profitable tree to grow on the poorly drained soils. Hardwood brush thrives on these soils, and its control when establishing pine is more of a problem than on better drained soils. The problem of controlling hardwood brush is proportional to the site-index of the soils for loblolly pine. On the dry Rumford soils, brush is much less of a problem than it is on wet soils; consequently, pine is easier to establish in the poor or fair sites than in good sites. However, the high yield of timber from the better soils is worth the cost of controlling the brush.

The best soils for general farming are also good soils for pine and for hardwoods. However, the best soils for loblolly pine are those that require drainage before they can be made highly productive for general crops. The very widespread Sloping sandy land and Steep sandy land are for the most part unsuited to general farming, but they are good for both pines and hardwoods. It appears that in the future good sites will be available for forestry without competing with agriculture for the better soils.

Interpretations for Wildlife

Wildlife is an important natural resource of Northumberland and Lancaster Counties. Few specific correlations between wildlife and soils can be made. However, many indirect relationships exist. Soil quality influences the way land is used, and land use influences the food and protection available to game and other wild animals.

All soils can be used for wildlife whenever the landowner chooses. Habitat for wildlife should be a use of land that is poor for farming. The Beltsville and Caroline soils, the steep phases of the Sassafras and Kempsville soils, Sloping sandy land and Steep sandy land are poor for farming. Areas of these soils should be seeded and planted to food and cover and protected for the benefit of upland species of wildlife. Other soils suited to wildlife are the poorly drained Othello, Fallsington, Elkton, Bladen, and Lenoir soils. Some areas of these soils are well suited to the development of ponds for game fish, waterfowl, and bait. There are also commercial possibilities of developing these areas as shooting preserves.

Fresh-water fisheries are influenced by runoff from fertile soils. There is reason to believe, therefore, that the maintenance of high soil fertility may influence the abundance of salt-water fish and shellfish in the many tidal creeks and rivers of the area.

A list of some of the more prevalent species of wildlife in the area follows.

Upland game	Deer
	Cottontail rabbit
	Gray squirrel
	Quail
	Dove
Fur bearers	Fox (red and gray)
	Muskrat
	Otter
	Mink
	Raccoon
	Opossum
	Skunk
Waterfowl	Ducks
	Canada geese
Fresh-water fish	Largemouthed black bass
	Smallmouthed black bass
	Bluegill
Salt-water fish	Shad
	Herring
	Spot
	Croaker
	Rockfish (striped bass)
	Bluefish
Shellfish	Oyster
	Soft-shelled crab
	Blue crab

The county agricultural agent and the people in the Soil Conservation Service can provide assistance in developing areas for wildlife.

Engineering Properties of the Soils

The soil survey report for Northumberland and Lancaster Counties, Va., contains information that can be used by engineers to—

1. Make soil and land use studies that will aid in the selection and development of industrial, business, residential, and recreational sites.
2. Make preliminary estimates of the engineering properties of soils in planning agricultural drainage systems, farm ponds, irrigation systems, and other structures for water and soil conservation.
3. Make reconnaissance surveys of soil and ground conditions that will aid in locating highways and airports and in planning detailed soil surveys for their intended locations.
4. Locate sources of sand and gravel.
5. Correlate pavement performance with types of soil and thus develop information that will be useful in designing and maintaining pavements.
6. Determine the suitability of soil units for cross-country movement of vehicles and construction equipment.
7. Supplement information obtained from other published maps and reports and aerial photographs for the purpose of making soil maps and reports that can be used readily by engineers.
8. Estimate the nature of material encountered when excavating for buildings and other structures.

The mapping and the descriptive report are somewhat generalized, however, and should be used only in planning more detailed field surveys to determine the in-place condition of the soil at the site of the proposed engineering construction.

This section of the soil survey report provides engineers with brief descriptions of the soils and their physical properties, with interpretations of these properties for engineering construction, and with laboratory test data for the main soil types in Northumberland and Lancaster Counties.

Some of the terms used by the soil scientist may be unfamiliar to the engineer, and some words, for example, soil, clay, silt, sand, may have special meanings in soil science. These and other terms used in the soil survey report are defined in the Glossary at the end of the report.

Engineering Soil Classification Systems

Most highway engineers classify soil materials according to the system approved by the American Association of State Highway Officials (*1*). In this system, soil materials are classified in seven principal groups. The groups range from A–1, which consists of gravelly soils of high bearing capacity, to A–7, which consists of clay soils having low strength when wet. In each group, the

TABLE 8.—*Brief description of soils of Northumberland and Lancaster Counties, Va., and their estimated physical properties*

Symbol on map[1]	Soil name	Depth to seasonal high water table	Generalized soil description	Depth from surface in typical profile	Classification		Permeability[4]	Shrink-swell potential
					Unified[2]	AASHO[3]		
		Feet		*Inches*				
BeA	Beltsville very fine sandy loam, nearly level.	1–2	Moderately well drained, slightly to moderately plastic silt loam to silty clay loam (primarily ML or CL; A–4); level to gentle slopes; impervious fragipan about 2 feet from surface causes perched water table in wet seasons; permanent water table is deep.	0 to 7	SM, SC, or ML.	A–2 or A–4.	Moderate	Low.
BeB	Beltsville very fine sandy loam, gently sloping.			7 to 24	ML or CL	A–4 or A–6.	Moderate	Moderate.
BeB2	Beltsville very fine sandy loam, gently sloping, eroded.			24 to 36	SC, ML, or CL.	A–4 or A–6.	Slow	Low to moderate.
				36 to 60+	ML, CL, or MH.	A–4, A–6, or A–7.	Moderate	Moderate.
Br	Bertie silt loam	1½	Somewhat poorly drained, slightly to moderately plastic silt loam to clay loam (primarily ML or CL; A–4) to depth of about 3 feet; underlain by loamy sand (principally SP or SM; A–3); nearly level positions.	0 to 7	SC, ML, or CL.	A–4 or A–6.	Moderate	Low.
				7 to 36	ML or CL	A–4 or A–6.	Moderate	Moderate.
				36 to 50+	SP–SM	A–3	Rapid	Low.
Bt	Bladen silt loam	0	Poorly drained to very poorly drained, stratified silt loam to highly plastic clay (SC to CH: A–4 to A–7); nearly level positions.	0 to 9	SC, ML, or CL.	A–4 or A–6.	Moderate	Low.
				9 to 42	CL, MH, or CH.	A–6 or A–7.	Slow	High.
				42 to 75+	SC, ML, CL, or CH	A–4, A–6, or A–7.		Moderate to high.
CfB2	Caroline very fine sandy loam, gently sloping, eroded.	10	Well-drained, stratified very fine sandy loam to plastic clay (primarily ML or CL; A–4 to A–6 but ranges from SM to CH; A–4 to A–7); gentle to strong slopes.	0 to 8	SM, SC, or ML.	A–2 or A–4.	Moderate	Low.
CfC2	Caroline very fine sandy loam, sloping, eroded.			8 to 36	ML, CL, or MH.	A–4, A–6, or A–7.	Slow to moderate.	Moderate.
CaC3	Caroline clay loam, sloping, severely eroded.			36 to 60+	CL, MH, or CH.	A–6 or A–7.	Slow to moderate.	Moderate to high.
CaD3	Caroline clay loam, strongly sloping, severely eroded.	The Caroline clay loams do not have the 0- to 8-inch surface layer, but otherwise they are like the Caroline very fine sandy loams.						
Co	Coastal beach	0	Narrow strips of loose sand (SP; A–3); partly under water at high tide.	0 to 60+	SP	A–3	Rapid	None.
CsA	Craven silt loam, nearly level.	1–2	Moderately well drained silt loam to highly plastic clay (primarily ML to CH; A–4 to A–7); occupies nearly level to strong slopes; strongly sloping areas are severely eroded.	0 to 9	ML or CL	A–4 or A–6.	Moderate	Low.
CsB2	Craven silt loam, gently sloping, eroded.			9 to 40	CL, MH, or CH.	A–6 or A–7.	Slow to moderate.	High.
CsC2	Craven silt loam, sloping, eroded.			40 to 60+	SC, CL, MH, or CH.	A–6 or A–7.	Slow to moderate.	High.
CrD3	Craven clay loam, strongly sloping, severely eroded.	This soil lacks the 0- to 9-inch surface layer common in the other Craven soils.						
Dr	Dragston fine sandy loam	1–1½	Somewhat poorly drained sandy loam to sandy clay loam (primarily SM; A–4) to a depth of about 3 feet; underlain by sand and loamy sand (SP or SM; A–2 or A–3); nearly level positions.	0 to 9	SM or SC	A–2 or A–4.	Rapid	Low.
				9 to 35	SM, SC, ML, or CL.	A–4 or A–6.	Moderate	Moderate to low.
				35 to 60	SM or SP	A–2 or A–3.	Rapid	Low.
Ek	Elkton silt loam	0	Poorly drained, stratified, slightly plastic silt loam to highly plastic clay (SC to CH; A–4 to A–7); nearly level positions.	0 to 8	SC, ML, or CL.	A–4 or A–6.	Moderate	Low.
				8 to 42	ML, CL, MH, or CH.	A–4, A–6, or A–7.	Slow	Low to high.
				42 to 62+	CL, MH, or CH.	A–6 or A–7.	Slow	High.

Fa	Fallsington fine sandy loam.	0	Poorly drained sandy loam to sandy clay loam (SM to ML; A–4) to a depth of about 2 or 3 feet; underlain by sand or loamy sand (SP or SM; A–2 or A–3); flat to nearly level positions.	0 to 10	SM or SC	A–2 or A–4	Moderate	Low.
				10 to 34	SM, SC, ML, or CL.	A–4 or A–6	Moderate	Moderate to low.
				34 to 65+	SM or SP	A–2 or A–3	Rapid	Low.
KeA KeB KeB2 KeC2 KeC3	Kempsville fine sandy loam, nearly level. Kempsville fine sandy loam, gently sloping. Kempsville fine sandy loam, gently sloping, eroded. Kempsville fine sandy loam, sloping, eroded. Kempsville fine sandy loam, sloping, severely eroded.	10	Well-drained, stratified sandy loam to moderately plastic sandy clay loam (SM to CL; A–2 to A–6); occupies nearly level to sloping positions; slowly permeable layer 3 to 4 feet below surface causes perched water table during long wet periods; other times water table is deep.	0 to 11	SM or SC	A–2 or A–4	Moderate	Low.
				11 to 42	SM, SC, ML, or CL.	A–4 or A–6	Moderate	Moderate to low.
				42 to 55	SC, ML, or CL.	A–4 or A–6	Slow	Moderate to low.
				55 to 66	ML, CL, or MH.	A–4 or A–6	Moderate	Moderate to low.
LaB	Lakeland loamy fine sand, gently sloping.	4–10	Excessively drained loamy sand (SM; A–2); underlain by loamy sand or sand (SM or SP; A–2 or A–3) about 3 feet below surface; thin strata and pockets of sandy clay loam are common; nearly level to gentle slopes; water table depends largely upon elevation.	0 to 9	SM	A–2	Rapid	Low.
				9 to 30	SM	A–2	Rapid	Low.
				30 to 60+	SM or SP	A–2 or A–3	Rapid	Low.
Le	Lenoir silt loam	1–1½	Somewhat poorly drained, stratified, slightly plastic silt loam to highly plastic clay (ML to CH; A–4 to A–7); nearly level positions.	0 to 7	ML or CL	A–4 or A–6	Moderate	Low.
				7 to 36	ML, CL, MH, or CH.	A–4, A–6, or A–7.	Slow	Low to high.
				36 to 72	C1, MH, or CH.	A–6 or A–7	Slow	High.
Lo	Local alluvial land	3–10+	Well drained to moderately well drained loam (ML; A–4) to a depth of about 3 feet; underlain by loamy sand, sandy clay loam, and clay loam (SM to CL; A–4 to A–6); some gentle slopes but largely in depressions.	0 to 46	SC or ML	A–4	Moderate	Low.
				46 to 60+	SC, ML, or CL.	A–4 or A–6	Moderate	Moderate.
MaA MaB MaB2 MaC2 MaD2	Matapeake silt loam, nearly level. Matapeake silt loam, gently sloping. Matapeake silt loam, gently sloping, eroded. Matapeake silt loam, sloping, eroded. Matapeake silt loam, strongly sloping, eroded.	6–10	Well-drained loam to clay loam (SC to CL; A–4 to A–6); underlain by sandy loam and loamy sand (SM; A–2 or A–3) at depth of about 3½ feet; nearly level to strong slopes; water table depends largely on elevation.	0 to 9	SC or ML	A–4	Moderate	Low.
				9 to 40	ML or CL	A–4 or A–6	Moderate	Moderate.
				40 to 75+	SM or SP	A–2 or A–3	Rapid	Low.
Mt	Mattapex silt loam	1½–2	Moderately well drained, slightly plastic silt loam to moderately plastic clay loam (ML to CL; A–4 to A–6); underlain at a depth of about 3 feet by sand and loamy sand (SM; A–2); nearly level positions.	0 to 10	SC, ML, or CL	A–4 or A–6	Moderate	Low.
				10 to 40	ML, CL, or MH.	A–4, A–6, or A–7.	Moderate	Moderate to high.
				40 to 60+	SM or ML	A–2 or A–4	Rapid	Low.

TABLE 8.—*Brief description of soils of Northumberland and Lancaster Counties, Va., and their estimated physical properties*—Continued

Symbol on map [1]	Soil name	Depth to seasonal high water table	Generalized soil description	Depth from surface in typical profile	Classification		Permeability [4]	Shrink-swell potential
					Unified [2]	AASHO [3]		
		Feet		*Inches*				
Mx	Mixed alluvial land	0	Poorly drained, stratified loamy sand to moderately plastic silty clay (SM to CL; A-2 to A-6); flood plains along streams.	0 to 75+	SM, SC, ML, or CL.	A-2, A-4, or A-6.	Moderate to rapid.	Low to moderate.
Ot	Othello silt loam	0	Poorly drained, slightly plastic silt loam to moderately plastic clay loam (ML to CL; A-4 to A-6) to a depth of about 3 feet; underlain by sand and loamy sand (SM; A-2 or A-4); nearly level positions.	0 to 6	SC, ML, or CL.	A-4 or A-6	Moderate	Low to moderate.
				6 to 35+	ML, CL, or MH.	A-4, A-6, or A-7.	Moderate	Moderate.
				35 to 55	SM	A-2 or A-4	Rapid	Low.
RuB	Rumford loamy sand, gently sloping.	40+	Well-drained to somewhat excessively drained sand and loamy sand with thin strata of slightly plastic sandy clay loam (SM; A-2 to A-4); gently sloping to sloping positions.	0 to 16	SM	A-2	Rapid	Low.
RuC2	Rumford loamy sand, sloping, eroded.			16 to 30	SM or SC	A-2 or A-4	Moderate to rapid.	Low.
				30 to 75+	SM or SP	A-2 or A-3	Rapid	Low.
RtB	Rumford loamy sand, thick surface, gently sloping.	The surface layer in this soil is 16 to 30 inches thick, otherwise it is like that in the other Rumford soils.						
SaA	Sassafras fine sandy loam, nearly level.	40+	Well-drained to somewhat excessively drained loamy sand, fine sandy loam, and slightly plastic sandy clay loam (SM to CL; A-2 to A-6); underlain by sand and loamy sand at a depth of about 3½ feet; water table is shallower in soils of low elevation; nearly level to strong slopes.	0 to 11	SM or SC	A-2 or A-4	Moderate	Low.
SaB	Sassafras fine sandy loam, gently sloping.			11 to 42	SC or CL	A-4 or A-6	Moderate	Moderate.
SaB2	Sassafras fine sandy loam, gently sloping, eroded.			42 to 75+	SM or SP	A-2 or A-3	Rapid	Low.
SaC2	Sassafras fine sandy loam, sloping, eroded.							
SaC3	Sassafras fine sandy loam, sloping, severely eroded.							
SaD2	Sassafras fine sandy loam, strongly sloping, eroded.							
SaD3	Sassafras fine sandy loam, strongly sloping, severely eroded.							
SfA	Sassafras loamy fine sand, thick surface, nearly level.	The surface layer in Sassafras loamy fine sands is 16 to 24 inches thick, and it is somewhat coarser than that in the Sassafras fine sandy loams.						
SfB	Sassafras loamy fine sand, thick surface, gently sloping.							
SsD	Sloping sandy land	10+	Mainly sand, loamy sand, and fine sandy loam (SP or SM; A-2 or A-4) but stratified with materials ranging to highly plastic clay (CH; A-7); sloping to very steep positions; occasional thin layers of consolidated ferruginous sandstone; water table generally deep, but seepy spots are common.	0 to 10	SM or SC	A-2 or A-4	Rapid	Low.
StE	Steep sandy land.			10 to 75+	SM or SP	A-2 to A-3	Rapid	Low.

To Th	Tidal marsh, low Tidal marsh, high.	0	Soil material is mixed sand, silt, clay, and some organic matter; normally covered by water at high tide; vegetation is marsh grass.		SM to CL	A-2 or A-6		Low to moderate.
Wo	Woodstown fine sandy loam.	1½-2	Moderately well drained sandy loam and slightly plastic sandy clay loam (SM to CL; A-2 to A-6) to a depth of about 3 feet; underlain by sand and loamy sand; nearly level positions.	0 to 10	SM or CL	A-2 or A-4	Moderate	Low.
				10 to 34	SC or CL	A-4 or A-6	Moderate	Moderate to low.
				34 to 75+	SM or SP	A-2 or A-3	Rapid	Low.

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[1] The soil symbol identifies the soil on the map at the back of the report. The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, or E, shows the slope. Symbols without a slope letter are those of nearly level soils, such as Elkton silt loam, or the land types such as Coastal beach. Soils that are eroded have a final number, 2 or 3, in their symbol.

[2] Described in the publication "The Unified Soil Classification System" (*13*).

[3] Described in the publication "Standard Specifications for Highway Materials and Methods of Sampling and Testing" (*1*).

[4] Degrees of permeability are: Slow, 0 to 0.2 inch per hour; moderate, 0.2 to 5.0 inches per hour; rapid, 5.0 to 10 inches+ per hour.

TABLE 9.—*Interpretations of soil properties for engineering—*

[Absence of data in columns indicates

Soil series or land type	Map symbols	Soil suitability—			
		As a source of topsoil	As a source of material for subbase	For removal of topsoil in shallow grading sections	For earthwork in wet seasons
Beltsville	BeA, BeB, BeB2	Fair	Fair	Not suitable	Not suitable [1]
Bertie	Br	Fair to poor	Not suitable	Not suitable	Not suitable [1]
Bladen	Bt	Fair	Not suitable	Not suitable	Not suitable
Caroline	CfB2, CfC2, CaC3, CaD3	Fair	Not suitable	Not suitable	Fair to poor
Coastal beach	Co	Not suitable	Poor	Not suitable	Good
Craven	CsA, CsB2, CsC2, CrD3	Poor	Not suitable	Not suitable	Poor to not suitable.
Dragston	Dr	Good	Fair	Not suitable	Poor
Elkton	Ek	Poor	Not suitable	Suitable	Not suitable
Fallsington	Fa	Good	Fair	Not suitable	Poor [1]
Kempsville	KeA, KeB, KeB2, KeC2, KeC3	Good	Good	Not suitable	Fair
Lakeland	LaB	Fair	Poor	Not suitable	Fair to good
Lenoir	Le	Poor	Not suitable	Not suitable	Not suitable
Local alluvial land	Lo	Fair to good	Not suitable	Not suitable	Fair
Matapeake	MaA, MaB, MaB2, MaC2, MaD2	Fair to good	Poor	Not suitable	Fair to poor
Mattapex	Mt	Poor to fair	Poor	Not suitable	Not suitable [1]
Mixed alluvial land	Mx	Not suitable	Not suitable	Not suitable	Not suitable
Othello	Ot	Poor	Not suitable	Not suitable	Not suitable [1]
Rumford	RuB, RuC2, RtB	Fair	Fair	Not suitable	Good
Sassafras	SaA, SaB, SaB2, SaC2, SaC3, SaD2, SaD3, SfA, SfB.	Good	Good	Not suitable	Fair to good
Sloping sandy land	SsD	Fair	Good	Not suitable	Fair to good
Steep sandy land	StE	Fair	Good	Not suitable	Fair to good
Tidal marsh, high	Th	Not suitable	Not suitable	Suitable	Not suitable
Tidal marsh, low	To	Not suitable	Not suitable	Suitable	Not suitable
Woodstown	Wo	Good	Good	Not suitable	Fair

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[1] Because of position, soil might be made suitable for earthwork in wet seasons by installation of ditches.

Northumberland and Lancaster Counties, Va.

soil is not suitable for the stated use]

Soil suitability—Continued		Location of desired gradeline	Hazards that affect construction of—		Type of farm pond to which soil is suited
For sewage-disposal systems	For agricultural irrigation		Open ditch drainage	Tile drainage	
Poor	Not suitable	4 feet minimum above water table.			Impounded.
Poor	Fair	4 feet minimum above water table.	Caving; flowing sand.	Sandy substrata.	Excavated.
Poor	Not suitable	4 feet minimum above water table.			Excavated.
Fair to poor	Fair	Anywhere if adequate surface drainage is provided.			Impounded.
		1 foot minimum above high tide.			
Poor	Not suitable	4 feet minimum above water table.			Impounded or excavated.
Poor	Fair	4 feet minimum above water table.	Caving; flowing sand.	Sandy substrata.	
Poor	Not suitable	4 feet minimum above water table.			Excavated or impounded.
Poor	Fair	4 feet minimum	Caving; flowing sand.	Sandy substrata.	Excavated.
Fair	Fair to good	Anywhere if adequate surface drainage is provided.			(2).
Good	Good	Anywhere if adequate surface drainage is provided.			
Poor	Not suitable	4 feet minimum above water table.			Excavated or impounded.
Poor	Fair to good	Anywhere if adequate surface drainage is provided.			
Good	Good	4 feet minimum above water table.			(2).
Fair	Fair	4 feet minimum above water table.			Impounded.
Poor	Not suitable	2 to 3 feet minimum above high water.			(2).
Poor	Not suitable	4 feet minimum above water table.	Caving; flowing sand.	Sandy substrata.	Excavated.
Good	Good	Anywhere if adequate surface drainage is provided.			
Good	Good	Anywhere if adequate surface drainage is provided.			(2).
Fair	Not suitable	Anywhere if adequate surface drainage is provided.			(2).
Fair	Not suitable	Anywhere if adequate surface drainage is provided.			(2).
	Not suitable	3 to 4 feet minimum above water level.			
	Not suitable	3 to 4 feet minimum above water table.			
Fair	Good	4 feet minimum above water table.		Sand substrata.	(2).

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[2] On-site investigation should be made before ponds are constructed.

TABLE 10.—*Engineering*

Soil name and location	Parent material	Virginia report number	Depth	Horizon	Moisture-density [2]	
					Maximum dry density	Optimum moisture
Beltsville very fine sandy loam:			*Inches*		*Lb. per cu. ft.*	*Percent*
Browns Store. (Northumberland Co.)	Coastal Plain sediment.	S036983	0–7	A_p	118	11
		S036984	7–23	B_2	120	13
		S036985	23–34	BM	124	10
		S036986	34–60	C	111	17
Bertie silt loam:						
Ophelia; near the Potomac River along Saunder Lane. (Northumberland Co.)	Coastal Plain sediment.	S036990	0–7	A_p	106	15
		S036991	7–32	B_2	117	15
		S036992	43–72	C	100	17
Craven silt loam:						
Mundy Point; Courtney farm. (Northumberland Co.)	Coastal Plain sediment.	S036966	0–9	A_p	108	15
		S036967	9–23	B_{21}	110	16
		S036968	23–42	B_{22}	101	21
		S036969	42–93	C	98	22
Dragston fine sandy loam:						
1.5 miles south of Ottoman, ⅝ mile east of Hartsville Church. (Lancaster Co.)	Coastal Plain sediment.	S036996	0–9	A_p	116	12
		S036997	9–27	B_2	121	11
		S036998	35–60	C	104	15
Fallsington fine sandy loam:						
1 mile south of Ottoman, ⅜ mile east of Hartsville Church. (Lancaster Co.)	Coastal Plain sediment.	S036993	3–7	A_2	117	12
		S036994	7–27	B_2	125	10
		S036995	34–65	C	103	14
Lenoir silt loam:						
Mundy Point; Courtney farm. (Northumberland Co.)	Coastal Plain sediment.	S036979	0–7	A_p	106	16
		S036980	7–16	B_{21}	116	14
		S036981	16–36	B_{22}	113	16
		S036982	36–72	C	98	23
Matapeake silt loam:						
Lilian; Locksley Hall farm. (Northumberland Co.)	Coastal Plain sediment.	S036973	0–9	A_p	115	13
		S036974	9–32	B_2	118	14
		S036975	40–66	C	123	11
Othello silt loam:						
Ophelia; near the Potomac River subdivision. (Northumberland Co.)	Coastal Plain sediment.	S036987	2–6	A_2	106	17
		S036988	6–27	B_2	112	16
		S036989	35–55	C	111	10
Sassafras fine sandy loam:						
Hamlins Corner; Mantua farm. (Northumberland Co.)	Coastal Plain sediment.	S036976	0–10	A_p	123	10
		S036977	14–33	B_2	124	12
		S036978	42–66	C	106	12
Woodstown fine sandy loam:						
Walnut Point; J. Brooks farm. (Northumberland Co.)	Coastal Plain sediment.	S036970	0–10	A_p	114	12
		S036971	16–29	B_2	125	10
		S036972	34–78	C	111	12

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[1] Tests performed by the Virginia Department of Highways under a cooperative agreement with the U.S. Dept. Com., Bur. Pub. Roads, in accordance with standard procedures of the American Association of State Highway Officials (AASHO).

[2] Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (*1*): The moisture-density relations of soils using a 5.5-lb. rammer and a 12-inch drop, AASHO Designation: T 99–57, Method A.

[3] Mechanical analysis according to the American Association of State Highway Officials Designation T 88. Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS

test data [1]

Mechanical analysis [3]									Liquid limit	Plasticity index	Classification	
Percentage passing sieve					Percentage smaller than—						AASHO [4]	Unified [5]
⅜ in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
--------	--------	100	98	62	55	35	13	6	17	(6)	A-4(5)	ML.
--------	--------	100	98	71	67	49	24	16	24	6	A-4(7)	ML-CL.
--------	--------	100	98	54	46	33	19	12	16	(6)	A-4(4)	ML.
--------	100	99	96	55	49	42	34	30	36	10	A-4(4)	ML-CL.
--------	--------	100	98	83	76	56	17	10	25	(6)	A-4(8)	ML.
--------	--------	100	98	85	79	58	30	21	26	5	A-4(8)	ML-CL.
--------	--------	100	88	6	4	4	3	2	(6)	(6)	A-3(0)	SP-SM.
--------	--------	100	97	84	78	63	21	11	25	(6)	A-4(8)	ML.
--------	--------	100	96	80	77	62	42	33	34	13	A-6(9)	CL.
--------	--------	100	94	72	69	62	50	44	53	26	A-7-6(16)	MH-CH.
--------	--------	100	99	91	88	77	60	51	59	32	A-7-6(20)	CH.
--------	--------	100	97	44	40	30	16	9	16	(6)	A-4(2)	SM.
--------	--------	100	97	45	40	34	23	16	21	3	A-4(2)	SM.
--------	--------	100	98	15	10	10	10	8	21	(6)	A-2-4(0)	SM.
--------	--------	100	96	40	36	26	14	8	19	(6)	A-4(1)	SM.
--------	--------	100	95	32	29	25	18	11	16	(6)	A-2-4(0)	SM.
--------	--------	100	98	10	10	9	8	6	21	(6)	A-3(0)	SP-SM.
--------	--------	100	99	90	82	54	19	8	25	1	A-4(8)	ML.
--------	100	99	94	83	80	64	35	25	29	7	A-4(8)	ML-CL.
--------	100	98	88	64	59	52	41	35	40	17	A-6(9)	CL.
--------	--------	100	98	92	89	80	62	52	60	30	A-7-5(20)	MH-CH.
--------	--------	100	90	68	62	41	15	8	23	3	A-4(7)	ML.
--------	--------	100	92	69	63	47	27	20	28	8	A-4(7)	CL.
100	98	90	58	14	12	8	5	5	15	(6)	A-2-4(0)	SM.
--------	--------	100	98	86	77	52	23	14	30	3	A-4(8)	ML.
--------	--------	100	99	93	87	65	35	25	32	9	A-4(8)	ML-CL.
--------	--------	100	98	13	11	10	7	3	14	(6)	A-2-4(0)	SM.
--------	--------	100	89	42	39	28	10	6	16	(6)	A-4(1)	SM.
--------	--------	100	91	50	48	38	25	18	25	7	A-4(3)	SM-SC.
--------	--------	100	89	6	5	5	4	3	11	(6)	A-3(0)	SP-SM.
--------	--------	100	97	49	46	32	14	9	15	(6)	A-4(3)	SM.
--------	--------	100	97	52	50	37	18	12	16	(6)	A-4(3)	ML.
--------	--------	100	94	13	11	8	4	3	14	(6)	A-2-4(0)	SM.

soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis used in this table are not suitable for use in naming textural classes for soils.

[4] Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (*1*): The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes, AASHO Designation M 145-49 (*1*).

[5] Based on the Unified Soil Classification System, Tech. Memo. No. 3-357, v. 1, Waterways Expt. Sta., Corps of Engin., March 1953 (*13*).

[6] Nonplastic.

relative engineering value of the soil material is indicated by a group index number. Group index numbers range from 0 for the best materials to 20 for the poorest. The group index number is shown in parentheses, following the soil group symbol.

Some engineers prefer to use the Unified soil classification system (*13*). In this system, soil materials are identified as coarse grained, 8 classes; fine grained, 6 classes; and highly organic soils. An approximate classification of soils by this system can be made in the field. Soils are classified according to both systems in tables 8 and 10 in this part of the report.

Soil Characteristics Significant to Engineering

A brief description of the soils mapped in Northumberland and Lancaster Counties and estimates of their physical properties that are significant in engineering are given in table 8. The engineering classifications in table 8 are based mainly on laboratory data given in table 10 and on experiences with the soils in these and other counties. Additional information about the soils can be obtained in the section "Descriptions of the Soils."

Most soils in Northumberland and Lancaster Counties have a low to moderate shrink-swell potential. The shrink-swell potential is an indication of the volume change to be expected with a change in moisture content. It is estimated primarily on the basis of the amount and type of clay. In general, soils classified as CH and A–7 have a "high" shrink-swell potential (see table 8). Clean sand and gravel (single-grain structure) and material having small amounts of nonplastic to slightly plastic fines, as well as most other nonplastic to slightly plastic soil materials, have a "low" shrink-swell potential. Soils that change considerably in volume when their moisture content varies under normal climatic conditions are generally not suitable for use in the upper parts of dams or road embankments.

Permeability refers to the rate of movement of water through the soil material in its undisturbed state. Permeability depends mainly upon the soil texture and structure (see table 8). A knowledge of soil permeability is important in planning agricultural drainage and other kinds of structures for soil and moisture conservation. Topsoil used on the shoulders of roads should be sandy loam or loamy sand to withstand the wear of limited traffic.

Engineering Interpretations of Soil Properties

Interpretations of some soil properties significant in engineering are given in table 9. These data are based on information in other parts of the report and on experience obtained in working with the same kinds of soil in these and other counties. The main problems in highway work are caused by the nature of the soil material and drainage conditions. Soils of the Coastal Plains consist predominantly of sand, silt, and clay. Bedrock is at great depths below the surface.

Drainage characteristics of the soils are reflected in the interpretations regarding earthwork in wet seasons and in the location of desired gradeline. The suitability of the soil for earthwork in wet seasons depends mainly on the texture of the soil material, its natural water content, and the depth to the water table. Plastic clay soils and some silty soils with high water tables are difficult to work, to dry, and to compact. Consequently, they are rated "Not suitable."

Many soils that have a high water table can be more readily excavated and made more suitable as a source of material for embankments if drainage ditches are constructed before earthwork starts. Underdrains may be required where a high water table makes the soil unstable.

On level to nearly level, moderately wet to wet soils, roads should be built on embankments. The surface of rigid pavement should be at least 3 feet above the water table; that of flexible pavements, at least 4 feet. In low-lying areas where high tides or other water may flood the soils, roads should be constructed on embankments that are at least 3 feet above the level of high water.

Several areas of Tidal marsh and poorly drained Mixed alluvial land are high in organic matter and occur at extremely low elevations in Northumberland and Lancaster Counties. This organic material should be removed from roads or other structural sections so that it will not be used in earth structures. Roads in low areas should be built on embankments so that the surface of the pavement is at least 4 feet above water table. Topsoil that contains considerable amounts of organic matter should be removed through shallow grading.

The sand in some areas that have a deep water table is susceptible to wind erosion when it is exposed in excavations. This type of material may be stabilized by mixing other material with it. Road embankments that are built on coastal beach material must be protected from wave erosion. If wave action is slight, suitable vegetation should be planted to stop the damage from waves. If wave damage is severe, riprap should be used to protect the embankments.

Earthwork generally can be done in winter on the excessively drained, well drained, and moderately well drained sandy soils at elevations of 10 feet or more above sea level, if the required standards of compaction can be maintained.

The soils in Northumberland and Lancaster Counties lack gravel; however, some of the soils are possible sources for subbase material. Consequently, none of them is generally suitable as a source of subbase material, even though the maximum particle size is about 2 millimeters in diameter and can pass through a No. 10 sieve. These soils are rated poor to fair as a source of subbase material in table 9.

It is generally agreed that heavy-axle trucks, moving repeatedly on a rigid pavement whose subgrade consists of soil material 35 percent or more of which can pass through a No. 200 sieve, will forcefully eject the subgrade soil and water. Consequently, a base course consisting of coarse material is required for rigid pavement that will be subjected to a large volume of traffic bv heavily loaded trucks.

The ratings in table 9 regarding the suitability of soils for agricultural irrigation are based on texture and structure of the various profile horizons and on permeability, internal drainage, and water-holding capacity.

To be suitable for irrigation, soils should have the following characteristics: (a) Topography and slopes mild enough to insure water penetration rather than runoff; (b) enough permeability to allow adequate drainage; (c) a high water-holding capacity, yet enough aeration for unrestricted growth of roots; and (d) structure and other physical properties that will enable soil to resist erosion.

In planning agricultural drainage systems, soil permeability must be considered. A tile-drainage system may not be practical if the soil layers are slowly or very slowly permeable or if the water table is high. Open ditches may be used to remove the excess surface water and to lower the water table in slowly permeable soils. Additional information on drainage is described in the section "General Principles of Soil Management."

Caving and flowing sand are additional hazards that have to be considered in planning for open-ditch drainage. Flowing water may cause sand to cave from the walls of an open ditch and clog the channel. Tile drains can also become clogged if the substratum is sandy.

The type of farm pond for which the soil is suitable depends on the permeability of soil horizons. Ponds must be constructed in soils that will hold impounded water and not allow it to escape through a permeable sandy layer.

Sites for homes and buildings should be located where solid foundation footings and dry basements can be obtained. In addition, the soils should be suitable for septic-tank drainage fields.

On many construction sites, soil may vary considerably within the depth of the proposed excavation, and several soil units may occur within a short distance. The soil map and soil profile descriptions together with the descriptions of soil properties and the interpretations of properties for engineering construction should be used in planning detailed surveys of the soils at construction sites.

To make the best use of the soil maps and the soil survey report, the engineer should know the physical properties of the soil material and the in-place condition of the soil. After testing soil materials and observing their behavior in engineering structures, the engineer can develop design recommendations for the soil units delineated on the maps.

Soil Test Data

Soil samples from 10 of the most important soil types in Northumberland and Lancaster Counties have been tested to help evaluate the soils for engineering purposes. The results of these tests and the classification of each sample are given in table 10.

The engineering soil classifications in table 10 are based on data obtained by mechanical analysis and by tests to determine liquid limits and plastic limits. The mechanical analyses were made by combined sieve and hydrometer methods. Percentages of clay obtained by the hydrometer method should not be used in naming soil textural classes for soil classification.

The liquid limit and plastic limit tests measure the effect of water on the consistence of soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a solid to a semisolid or a plastic state. As the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material passes from a solid to a plastic state. The liquid limit is the moisture content at which the soil material passes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is in a plastic condition.

Table 10 also gives compaction (moisture-density) data for the tested soils. If a soil material is compacted at successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material will increase until the "optimum moisture content" is reached. After that, the density decreases with increase in moisture. The highest density obtained in the compaction test is termed "maximum dry density." Moisture-density data are important in earthwork, for, as a rule, optimum stability is obtained if the soil is compacted to about the maximum dry density when it is at approximately the optimum moisture content. The last column in table 10 shows the classification of the tested soils according to the Unified system (*13*).

Formation and Classification of the Soils

This section is in two parts. The first describes the soil-forming processes; the second discusses the soil classification system used in the United States and then classifies the soil series of Northumberland and Lancaster Counties according to this system.

Factors of Soil Formation

Soil is the product of soil-forming processes acting on minerals that have been deposited or accumulated by geologic agencies. The characteristics of the soil at any given place are determined by (1) the physical and mineralogical composition of the parent material; (2) the climate under which the soil material has accumulated and existed since accumulation; (3) the plant and animal life in and on the soil; (4) the relief or lay of the land; and (5) the length of time the forces of soil development have acted on the soil material (*10*).

Climate and vegetation are the active factors of soil genesis. They act on the parent material and change it to a body that has a definite morphology. The effects of climate and vegetation are conditioned by relief. The nature of parent material also affects the kind of profile that can be formed and in extreme situations may dominate in its formation. Finally, time is needed for changing of the parent material into a soil profile. The time needed for horizon differentiation may be much or little, but some time is always required. Usually a long time is required for the development of distinct horizons.

The factors of soil genesis are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effects of any one factor unless conditions are specified for the other four. They are so complex in their interrelationship that many of the processes that take place in soil development are not known.

Parent material

The parent material of soils in Northumberland and Lancaster Counties is unconsolidated marine sediment consisting of sand, silt, and clay, with occasional thin beds of marl. In places some of the sand has been consolidated to form thin layers of sandstone, which may be seen in roadcuts and terrace escarpments. In places, clay has been consolidated to form shale and marl has been consolidated to form lime rock. These consolidated materials are far under the surface and, according to drillers, are in thin formations and of limited extent (*5*).

The Coastal Plain sediments of Northumberland and Lancaster Counties have been classified in five geological terraces, which range in elevation from sea level to about 150 feet above sea level. (See section "Physiography, Relief, and Drainage," p. 1.) These Costal Plain sediments vary widely in texture from place to place. This feature is noticeable in soil profiles that have developed from the different sediment, even though some of the soils are mature and in equilibrium with their environment. The sandy Sassafras and Rumford soils have formed in coarse-textured sediment; the Craven and Lenoir soils have formed in fine-textured sediment; and the Bertie and Mattapex soils have firm, moderately fine textured profiles, underlain by rather coarse sand. These underlying deep strata are probably unrelated to the overlying soil profile. The same may be true of the more sandy soils that are underlain by fine-textured sediment.

Climate

The climate of Northumberland and Lancaster Counties is somewhat tempered by the Chesapeake Bay. It is mild with fairly cool winters and warm summers. The average annual snowfall is 2 to 4 inches. Periods of freezing weather range from 2 to 5 days duration. Occasional hot periods of more than a week occur late in summer. The average annual rainfall is about 42 inches.

The moderately warm and usually moist weather that prevails most of the year favors rapid chemical and physical reactions and the formation of soil low in organic matter. The relatively high rainfall promotes leaching of the more readily soluble material and causes soils to be strongly acid and low in natural fertility. The translocation of colloidal materials and the formation of textural soil horizons is caused by water percolating through the soil profile. The weathering and translocation of soil material are further intensified by freezing of soil to shallow depths for brief periods. Climate is also responsible for variations in plant and animal life, and it also guides these forces in soil development.

Plant and animal life

Trees, shrubs, grasses and other herbaceous plants, micro-organisms, earthworms, and various other forms of plant and animal life that live on and in the soil have a part in the soil forming processes. The changes caused by these biological forces depend largely on the kind of life processes peculiar to each.

Living organisms are thought to have a minor influence on soil development. Earthworms, insects, micro-organisms, and other forms of life break down organic matter and change soil structure. Bacteria, fungi, and other micro-organisms aid in weathering rock. They also have a large effect on chemical and biological processes that are active in the soil solum.

The native vegetation was a forest of hardwood mixed with occasional pine (*6*). Forests probably differed in the density of stands, in the relative proportion of species, and in the associated ground cover. On the better drained soils, forests were fairly uniform. Consequently, it is improbable that marked differences in the well-drained, well-developed soils of Northumberland and Lancaster Counties are the direct result of differences in vegetative cover.

Most of the hardwood trees are deep to moderately deep feeders of plant nutrients. The leaves of hardwood trees are higher in plant nutrients than those of the coniferous trees. On falling, they return essential plant nutrients to the surface soil and thereby retard the depleting action of percolating water. Much organic matter is also added to the soil in the form of dead leaves, twigs, roots, and entire plants. Most of it is added to the surface layer of soil and is acted upon by chemical and biological forces.

Relief

Northumberland and Lancaster Counties are on a series of marine terraces. Some of these terraces are broad, level flats; others are level to gently sloping ridgetops with steep sides.

The well-drained, level soils of the upland are normal soils. They have a moist soil climate (*3*), and their development has reached equilibrium with the environment. The soils on slopes and knolls and in depressions have formed under conditions that were subject to runoff, and they have a dry soil climate. On some steep slopes, runoff is so great that geologic erosion almost keeps even pace with soil formation. Soil materials do not remain in place long enough to allow formation of a profile having genetically related horizons. On these steep slopes, the quantity of water that percolates through the soil is small.

The height of the water table varies with the topography. It is nearest the surface in soils farthest from a drainage channel. The best drained soils in some areas of low neckland are on points near creeks or drainageways. Drainage is poorest in soils farthest from the drainageways.

Time

Time is necessary for a soil to develop from parent material. The length of time required depends on the other soil-forming factors. If the factors of formation have not operated long enough to form a soil that is nearly in equilibrium with the environment, the soil is considered young, or immature.

The parent material from which the soils of Northumberland and Lancaster Counties have formed were deposited thousand of years ago by the ocean. These deposits are quite young or recent in terms of geologic time. However, enough time has elapsed for rather mature soils to have been formed.

Soils in the two counties range in age from mature to young. The young soils—colluvial, alluvial, and steeply sloping soils—have not been in place long enough for mature profiles to have developed, or they are on slopes where geologic erosion has kept pace with soil development.

Classification of the Soils

The system of soil classification now being used in the United States consists of six categories, one above the other. Each successively higher category consists of a smaller total number of classes, and each of these classes has a broader range of characteristics. Thus, there are thousands of classes in the lowest category and no more than three in the highest category. Beginning at the top, the six categories in the system of soil classification are the order, suborder, great soil group, family, series, and type. Of these, only four have been widely used. They are the order, great soil group, series, and type. The categories of the soil order and the great soil group are described briefly in the following paragraphs. The terms "soil series" and "soil type" are defined in the Glossary. The highest category in the present system of soil classification consists of three classes, known as the zonal, intrazonal, and azonal orders.

This part of the report defines the soil orders and the great soil groups into which the soil series of Northumberland and Lancaster Counties have been classified, and it describes some of the internal characteristics of the soil series, which have been the basis for the classification. Results of the chemical analyses of several important soil types in the area are given at the end of the section in table 12. A profile for each main soil type that was mapped in this two-county area is described in detail in the section "Descriptions of the Soils." The seven miscellaneous land types, mapped in the area, have not been classified according to order and great soil group because of the extreme variability of their characteristics.

Zonal soils are those with well-developed soil characteristics that reflect the influence of the active factors of soil genesis—climate and living organisms, chiefly vegetation (*10*).

Intrazonal soils are those with more or less well-developed soil characteristics that reflect the dominant influence of some local factor of relief, parent material, or age over the normal effect of the climate and vegetation (*10*).

Azonal soils are those that have no well-developed profile characteristics, because of their youth, condition of parent material, or relief (*10*).

The soil series of Northumberland and Lancaster Counties, Va., have been classified into the following orders and great soil groups:

Order and great soil group	*Soil series*
Zonal soils:	
Gray-Brown Podzolic soils	Beltsville[1] Matapeake Mattapex[2] Sassafras Woodstown[2]
Red-Yellow Podzolic soils	Caroline Craven[2] Kempsville[3] Rumford[3]
Intrazonal soils:	
Low-Humic Gley soils	Fallsington Othello Elkton Bladen[4] Dragston[5] Bertie[5] Lenoir[5]
Azonal soils:	
Regosols	Lakeland

[1] Intergrade to Planosol.
[2] Intergrade to Low-Humic Gley.
[3] Intergrade to Gray-Brown Podzolic.
[4] Intergrade to Planosol and Low-Humic Gley.
[5] Intergrade to Gray-Brown Podzolic and Red-Yellow Podzolic.

The parent material and drainage of the soil series are shown in table 11.

Zonal soils

The zonal order in Northumberland and Lancaster Counties is represented by the Gray-Brown Podzolic and the Red-Yellow Podzolic soils and the intergrades of these to other great soil groups. These great soil groups and the soil series in each are discussed in the following paragraphs.

GRAY-BROWN PODZOLIC SOILS

The Gray-Brown Podzolic soils have distinct profiles with well-developed horizons. The soils are acid, and the normal solum is about 30 to 35 inches thick. In undisturbed areas, a mat of leaves and twigs, 1 to 3 inches thick, is on top of the mineral soil. The A_1 horizon is about 2 to 3 inches thick. The A_2 horizon is grayish brown or yellowish brown and 6 to 15 inches thick. A thin transitional horizon, which grades into a well-developed B

TABLE 11.—*The parent material and natural drainage of the soil series of Northumberland and Lancaster Counties*

Parent Material	Natural drainage				
	Excessive	Good to somewhat excessive	Moderately good	Somewhat poor	Poor
Coarse-textured marine sediment	Lakeland				
Moderately coarse textured marine sediment over sandy material.		Sassafras Rumford. Kempsville.	Woodstown	Dragston	Fallsington.
Moderately fine textured marine sediment over sandy material.		Matapeake	Mattapex	Bertie	Othello.
Moderately fine textured marine sediment over moderately fine to fine material.		Caroline	Beltsville		
Fine-textured marine sediment over fine material			Craven	Lenoir	Elkton. Bladen.

horizon, is normally present. Fine clay, leached and washed from the horizons above, has accumulated in the B horizon. This horizon has a blocky structure (*4*, *10*).

The Sassafras and Matapeake soils are typical Gray-Brown Podzolic soils. However, the Woodstown and Mattapex soils are moderately well drained and grade toward the Low-Humic Gley soils as indicated by gray mottles in the lower B horizon.

The Beltsville series has a yellowish-brown, friable surface layer; a brownish-yellow, friable, light silty clay loam upper B horizon; and a brittle, firm to hard fragipan at a depth of about 24 inches. The C horizon, below a depth of about 34 inches, is friable fine sandy clay loam.

The Beltsville soils are Gray-Brown Podzolic soils that have a fragipan or a heavier B horizon than is normal for the group and a rather abrupt change in texture between the surface soil and the subsoil. They are intergrades to Planosols. They are less well drained than typical Gray-Brown Podzolic soils because of their slowly permeable subsoil.

RED-YELLOW PODZOLIC SOILS

The Red-Yellow Podzolic soils are strongly leached, acid in reaction, and low in organic matter and plant nutrients. The surface layer is light colored and somewhat sandy; the subsoil is finer textured than the surface layer and is red, yellow, or mottled in color.

The Caroline, Craven, Kempsville, and Rumford series make up this great soil group. Of these, the Caroline is a typical Red-Yellow Podzolic soil.

The Craven series has some of the characteristics of the Low-Humic Gley soils as indicated by mottles in the lower B horizon. The Kempsville soils are transitional to the Gray-Brown Podzolic soils. They have a paler surface layer and a yellower subsoil than the Sassafras soils. The Kempsville also has a weak fragipan in the lower B horizon, which indicates it is also grading toward the Planosol great soil group. The Rumford series is a Red-Yellow Podzolic soil. However, a few of the browner than normal areas may intergrade toward the Gray-Brown Podzolic soils.[5]

Intrazonal soils

The intrazonal order in Northumberland and Lancaster Counties is represented by the Low-Humic Gley soils and the intergrades of this group to other great soil groups.

LOW-HUMIC GLEY SOILS

The Low-Humic Gley soils are poorly drained and somewhat poorly drained, have a thin surface layer, are moderately high in organic matter, and overlie mottled gray and brown, gleylike mineral horizons. They have been formed through the process of gleization, in which compounds of iron under alternately wet and moist conditions are reduced to soluble forms, and the solubility of calcium, magnesium, and manganese are increased. Gleization produces a gray or bluish layer deep in the soil and yellow, brown, and gray streaks along cracks and root channels in the upper horizons. The deep strata of the imperfectly drained Low-Humic Gley soils, where water is constantly draining away, tend to become gray instead of bluish (*4*, *8*).

The poorly drained Low-Humic Gley soils are of the Othello, Fallsington, Elkton, and Bladen series. The somewhat poorly drained members are of the Dragston, Bertie, and Lenoir series. All these soils have developed from acid marine sediment under a forest of mixed hardwood and pine. The soils have more or less well-developed characteristics that strongly reflect levelness of topography, high water table, impeded drainage, and the lesser influence of climate and vegetation. The surface layer ranges from gray to grayish brown; the subsoil, from dominantly gray to gray mottled with yellow and brown.

The Elkton and Bladen soils generally have a clay or silty clay subsoil, which is generally underlain by clayey material. The Bladen subsoil changes abruptly to clay, which strongly indicates intergrading toward Planosol (*10*). This change is more gradual with the Elkton series. In addition, the Bladen also has a dark-colored surface layer, which also indicates a tendency to intergrade toward Humic Gley.

The somewhat poorly drained Bertie, Dragston, and Lenoir series have brown and yellow colors in the surface layer and upper subsoil. This indicates these soils are grading toward the Gray-Brown Podzolic and the Red-Yellow Podzolic groups.

Azonal soils

The azonal order is represented by the Regosol great soil group.

REGOSOLS

The Regosols are soils that consist of deep, unconsolidated rock, in which few or no clearly expressed soil characteristics have developed. Regosols are mainly confined to recent sand dunes, loess, and glacial drift of the steeply sloping lands (*8*). In Northumberland and Lancaster Counties, the Lakeland series has been classified as a Regosol.

The Lakeland soils have formed in loose Coastal Plain sandy material and have a slightly developed profile.

Laboratory Analyses of the Soils

Table 12 gives the chemical analyses of representative soil types in Northumberland and Lancaster Counties.

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[5] SIMONSON, R. W. CLASSIFICATION OF SOILS IN THE MIDDLE ATLANTIC COASTAL PLAIN. 1956. [Unpublished study for improvement of series concepts and interregional correlations of the soils. Copy on file in SCS, Soil Survey, Beltsville, Maryland.]

TABLE 12.—*Chemical analyses*[1] *of representative soil types in Northumberland and Lancaster Counties, Va.*

Soil type and horizon	Depth from surface	pH	Available phosphorus	Organic matter	Exchangeable manganese	Exchangeable cations [2] (meq. per 100 grams soil)						Base saturation
						Calcium	Magnesium	Potassium	Sodium	Hydrogen	Total	
Beltsville very fine sandy loam:	*Inches*		*Parts per million*	*Percent*	*Parts per million*							*Percent*
A_p	0–7	6. 0	7. 2	1. 19	0. 44	2. 1	0. 7	0. 1	--------	2. 1	5. 0	58. 4
B_2	7–23	5. 0	3. 7	. 19	. 11	. 8	. 5	. 1	--------	3. 1	4. 5	31. 0
BM	23–34	4. 5	1. 8	. 08	. 44	. 1	. 3	. 1	--------	3. 2	3. 7	13. 1
C	34–60	4. 5	2. 3	. 12	. 44	. 1	. 9	. 1	0. 1	8. 4	9. 6	12. 4
Bertie silt loam:												
A_p	0–7	4. 3	4. 2	1. 47	. 22	. 5	. 3	. 1	. 1	6. 0	7. 0	13. 2
B_2	7–32	4. 5	. 9	. 36	. 11	. 9	. 7	. 1	. 2	8. 5	10. 4	17. 9
B_3	32–43	4. 6	2. 3	. 05	. 22	. 3	. 7	. 1	. 2	5. 3	6. 6	18. 0
C	43–72	4. 9	4. 2	. 01	. 22	. 1	. 1	--------	--------	1. 0	1. 2	21. 9
Bladen silt loam:												
A_p	0–7	5. 3	3. 2	2. 77	6. 60	6. 1	. 4	. 1	. 1	6. 2	12. 9	51. 5
A_1	7–15	6. 1	2. 1	1. 93	1. 32	14. 2	. 4	. 1	. 1	4. 6	19. 5	76. 3
B_{21}	15–29	6. 9	24. 0	. 51	. 44	13. 3	. 4	. 2	. 2	2. 2	16. 3	87. 8
B_{22}	29–40	6. 9	4. 6	. 50	. 88	15. 9	. 5	. 2	. 3	2. 8	19. 7	85. 8
B_3	40–55	6. 8	3. 7	. 50	. 22	15. 0	. 4	. 2	. 2	2. 3	18. 1	87. 3
C	55–86	6. 4	12. 5	. 22	. 22	9. 7	. 3	. 2	. 1	1. 6	11. 9	86. 8
Craven silt loam:												
A_p	0–9	5. 3	56. 3	2. 31	. 44	3. 8	. 4	. 1	--------	4. 4	8. 7	49. 5
B_{21}	9–23	4. 2	4. 2	. 41	. 11	2. 1	. 4	. 2	. 1	10. 3	13. 1	20. 9
B_{22}	23–42	4. 1	4. 2	. 25	. 22	. 9	1. 0	. 3	. 1	18. 3	20. 6	10. 9
C	42–93	3. 9	. 9	. 21	. 11	--------	1. 1	. 5	. 2	21. 1	23. 0	8. 2
Dragston fine sandy loam:												
A_p	0–9	4. 3	12. 9	1. 72	. 22	. 3	. 1	. 2	--------	6. 5	7. 1	8. 4
B_2	9–27	4. 5	6. 9	. 22	. 22	. 4	. 1	. 1	--------	5. 9	6. 5	9. 4
B_3	27–35	4. 4	4. 6	. 12	. 22	. 5	. 1	. 1	--------	4. 2	4. 9	16. 1
C	35–60	4. 4	2. 8	. 01	. 11	. 3	. 2	. 1	--------	3. 1	3. 7	16. 2
Elkton silt loam:												
A_1	0–2	3. 8	2. 8	10. 79	. 11	. 2	. 3	. 2	. 1	22. 6	. 4	3. 4
A_2	2–8	4. 1	7. 7	1. 58	. 22	. 1	. 2	. 1	--------	11. 8	12. 2	3. 4
B_{21}	8–16	4. 2	1. 6	. 80	. 11	--------	. 2	. 1	. 1	13. 2	13. 6	3. 1
B_{22}	16–43	4. 3	1. 2	. 31	. 11	--------	. 4	. 1	. 1	13. 4	14. 0	4. 5
C	43–62	4. 1	1. 8	. 24	. 11	--------	1. 0	. 4	. 5	16. 5	18. 4	9. 9
Fallsington fine sandy loam:												
A_0	2–0	3. 7	26. 3	54. 92	7. 81	7. 7	2. 7	1. 2	. 4	72. 4	84. 4	14. 1
A_1	0–3	3. 7	3. 2	4. 32	. 11	. 1	. 2	. 1	--------	10. 8	11. 2	3. 4
A_2	3–7	4. 1	2. 0	1. 63	. 11	--------	. 1	. 1	--------	7. 3	7. 5	2. 3
B_2	7–27	4. 1	1. 4	. 24	. 11	. 1	. 1	. 1	--------	5. 9	6. 2	3. 7
B^3	27–34	4. 2	1. 8	. 20	. 11	. 1	. 1	. 1	--------	5. 3	5. 6	4. 0
C	34–65	4. 3	2. 8	. 03	. 22	. 1	--------	. 1	--------	2. 9	3. 1	6. 4
Kempsville fine sandy loam:												
A_p	0–5	4. 7	2. 3	2. 57	1. 10	. 3	. 1	. 1	--------	7. 3	7. 8	6. 9
A^3	5–10	4. 7	1. 4	. 70	1. 32	. 1	. 1	. 1	--------	3. 4	3. 7	6. 8
B_1	10–14	4. 6	1. 2	. 31	. 44	. 1	. 2	. 1	--------	4. 0	4. 4	9. 6
B_{21}	14–30	4. 7	1. 8	. 31	. 55	. 5	. 5	. 1	--------	4. 8	5. 9	18. 7
B_{22}	30–45	4. 7	4. 2	. 11	. 22	. 2	. 4	. 1	--------	2. 8	3. 5	19. 0
B_m	45–57	4. 7	2. 8	. 06	. 33	. 1	. 2	. 1	--------	2. 6	3. 0	13. 3
C	57–72	4. 7	1. 4	. 00	. 22	. 2	. 5	. 1	--------	6. 4	7. 2	10. 8
Lakeland loamy fine sand:												
A_p	0–9	6. 2	7. 8	1. 09	. 11	1. 3	. 4	. 1	--------	2. 0	3. 8	47. 5
A_2	9–26	6. 6	2. 8	. 17	. 44	. 4	. 1	----	--------	. 7	1. 3	48. 2
C	26–51	6. 2	4. 0	. 00	. 22	. 4	. 1	--------	--------	. 6	1. 1	48. 7
D	51–75	5. 5	5. 5	. 13	. 11	1. 7	. 8	. 2	--------	2. 1	4. 9	56. 2

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[1] Analyses made in 1958 and 1959 by L. D. WHATLEY, W. J. EDMONDS, and H. L. MATHEWS at the Soil Laboratory of Virginia Polytechnic Institute. Data checked and assembled in 1960 by H. E. DAILEY.

[2] Dashes in columns indicate value was less than 0.1.

TABLE 12.—*Chemical analyses*[1] *of representative soil types in Northumberland and Lancaster Counties, Va.*—Con.

Soil type and horizon	Depth from surface	pH	Available phosphorus	Organic matter	Exchangeable manganese	Exchangeable cations[2] (meq. per 100 grams soil)						Base saturation
						Calcium	Magnesium	Potassium	Sodium	Hydrogen	Total	
	Inches		*Parts per million*	*Percent*	*Parts per million*							*Percent*
Lenoir silt loam:												
A_p	0–7	4. 9	8. 3	1. 86	1. 32	2. 2	0. 4	0. 1	0. 1	4. 7	7. 5	37. 3
B_{21}	7–16	4. 4	1. 1	. 32	. 22	1. 8	. 5	. 1	. 1	7. 9	10. 4	24. 0
B_{22}	16–36	4. 2	. 9	. 21	. 44	. 7	1. 0	. 3	. 2	16. 3	18. 5	11. 3
C	36–72	4. 0	. 5	. 18	. 22	. 1	2. 2	. 6	. 5	22. 9	26. 3	12. 8
Matapeake silt loam:												
A_p	0–9	6. 1	42. 0	1. 68	7. 48	3. 9	. 4	. 2	--------	3. 1	7. 7	59. 3
B_2	9–32	6. 3	2. 8	. 32	. 55	4. 8	. 2	. 1	. 1	2. 9	8. 1	64. 7
B_3	32–40	6. 1	7. 1	. 11	. 88	3. 5	. 2	. 1	. 1	2. 1	6. 0	64. 0
C	40–66	6. 2	13. 4	. 11	. 44	2. 3	. 1	. 1	--------	1. 6	4. 1	60. 2
Othello silt loam:												
A_1	0–2	4. 1	9. 7	9. 38	. 66	. 8	. 8	. 2	. 1	18. 7	20. 6	9. 2
A_2	2–6	4. 2	3. 7	2. 97	. 22	. 3	. 3	. 1	. 1	12. 0	12. 8	6. 4
B_2	6–27	4. 4	1. 4	. 29	. 77	. 6	1. 2	. 1	. 2	9. 6	11. 7	18. 2
B_3	27–35	4. 8	1. 7	. 17	. 22	. 1	1. 1	. 1	. 2	6. 4	7. 9	18. 4
C	35–55	4. 8	1. 8	. 10	. 11	. 1	. 1	--------	--------	1.	1. 6	17. 1
Rumford loamy sand:												
A_p	0–10	5. 3	8. 8	. 68	1. 98	. 6	. 0	. 1	--------	2. 3	3. 0	24. 2
A_3	10–16	5. 4	. 9	. 18	. 44	. 5	. 1	. 1	--------	1. 3	2. 0	35. 4
B_2	16–22	5. 9	2. 8	. 25	. 44	2. 4	. 2	. 1	--------	2. 5	5. 2	52. 1
B_3	22–29	5. 9	4. 2	. 17	. 22	1. 8	. 1	. 1	--------	1. 8	3. 9	53. 0
C	29–75	5. 8	3. 9	. 08	. 55	. 4	. 1	--------	--------	. 2	. 7	73. 4
Sassafras fine sandy loam:												
A_p	0–10	5. 6	12. 5	1. 11	3. 52	1. 4	. 3	. 1	--------	2. 9	4. 7	39. 3
B_1	10–14	6. 0	1. 8	. 45	1. 54	1. 6	. 6	. 1	--------	2. 5	4. 8	49. 0
B_2	14–33	5. 6	1. 7	. 26	1. 10	3. 1	. 8	. 1	--------	3. 6	7. 6	52. 5
B_3	33–42	4. 9	6. 2	. 09	2. 20	1. 0	. 8	. 1	--------	3. 3	5. 2	35. 8
C	42–66	4 9	6. 9	. 09	. 33	. 1	. 1	--------	--------	. 9	1. 1	24. 0
Woodstown fine sandy loam:												
A_p	0–10	5. 2	61. 8	2. 19	3. 52	1. 4	. 2	. 2	--------	7. 0	8. 8	20. 3
B_1	10–16	4. 8	9. 4	. 48	1. 54	. 4	. 2	. 1	--------	3. 4	4. 1	17. 4
B_2	16–29	4. 5	6. 9	. 14	. 44	. 9	. 2	. 1	--------	4. 3	5. 5	23. 3
B_3	29–34	4. 6	5. 1	. 10	. 11	. 6	. 1	. 1	--------	2. 8	3. 6	23. 2
C	34–78	4. 9	5. 5	. 10	. 66	. 6	. 2	. 1	. 1	1. 3	2. 2	43. 2

Glossary

In this section definitions of technical terms are given for the convenience of readers who cannot refer to them easily elsewhere. Most of the definitions are similar to those in published works on soil science (*10*, *11*), soil survey (*7*), and other technical publications.

Aeration, soil. The process by which air and other gases in the soil are renewed. The rate of soil aeration depends largely on the size and number of the pores in the soil and on the amount of water clogging the pores. A soil with many large pores is said to be well aerated.

Aggregate, soil. Many fine soil particles held in a single mass or cluster, such as a clod, crumb, block, or prism.

Alluvium. Sand, silt, and other sediment deposited on land by streams.

Base exchange capacity. The sum total of exchangeable cations absorbed by a soil, expressed in milliequivalents per 100 grams of soil. Measured values of cation-exchange capacity depend somewhat on the method used for determination.

Catena, soil. A group of soils, within a specific soil zone, developed from similar parent material but with unlike soil characteristics because of differences in relief or drainage.

Clay. As a soil separate, the small mineral soil particles less than 0.002 millimeter in diameter (approximately 0.00008 of an inch). Clay particles are the chemically active part of the soil. (See Texture, soil.)

Concretions. Hard grains, pellets, or nodules resulting from concentrations of compounds in the soil that cement the soil grains together. The composition of some concretions is unlike that of the surrounding soil. Concretions can be of various sizes, shapes, and colors.

Consistence, soil. The relative mutual attraction of the particles in the whole soil mass, or their resistance to separation or deformation. Consistence determines the degree of difficulty that will be encountered in maintaining the soil in a porous condition under cultivation, or the degree of compaction and load bearing one can obtain in construction. Terms commonly used to describe consistence are as follows:

Loose. Noncoherent.

Friable. Soil material crushes easily under gentle to moderate pressure between thumb and forefinger and coheres when pressed together.

Firm. Aggregates are stable and cannot be crumbled easily between the fingers.

Soft. Soil mass is very weakly coherent and fragile; breaks to powder or individual grains under very slight pressure.

Plastic. Soil mass is capable of being molded without rupture.

Sticky. Soil material is cohesive and does not separate easily.

Hard. Moderately resistant to pressure; can be broken in the hands without difficulty but is barely breakable between thumb and forefinger.

Cemented. Soil material is hard and brittle because of some cementing substance other than clay minerals.

Contour tillage. Furrows plowed at right angles to the direction of slope, at the same level throughout, and ordinarily at reasonably close intervals, to conserve soil and water on sloping soils.

Cover crop. A close-growing crop, such as a small grain, grass, or clover, used to protect and improve the soil between the periods when the regular crops are being grown.

Drainage, artificial. The removal of excess water in or on the soil by means of surface or subsurface drains.

Drainage ditch. An open ditch used to remove excess surface water.

Erosion, soil. The wearing away of the land surface by moving water, wind, or by other geological agents.

Normal. The erosion characteristic of the land surface in its natural environment undisturbed by human activity, as under protective cover of the native vegetation. This type of erosion is sometimes referred to as geological erosion, and it is not mapped in soil surveys.

Accelerated. The erosion of the soil or rock, at a rate higher than normal erosion, caused by changes in the natural cover or ground condition, including those caused by human activity. This type of erosion is identified and mapped in soil surveys.

Sheet. The removal of a fairly uniform layer of soil or material from the land surface by the action of rainfall and runoff water.

Escarpment, terrace. A long, usually steep slope that separates one geologic terrace from another.

Ferruginous. Iron-bearing; refers to material of comparatively high iron oxide content.

Fertility, soil. That quality of a soil that enables it to provide the proper compounds, in adequate amounts and in proper balance for the growth of specified plants, when other growth factors such as light, temperature, and the physical condition of the soil are favorable.

Field capacity. The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has been allowed to drain away; the field moisture content 2 or 3 days after a soaking rain.

Fluvial deposits. Soil material deposited by streams.

Genesis, soil. The mode of origin of the soil with special reference to the processes responsible for the development of the solum, or true soil, from the unconsolidated parent material.

Gleization. A process of soil formation in which the soil has been saturated with water for long periods. The waterlogging and lack of oxygen have caused the color to be a neutral gray.

Green-manure crop. Any crop grown for the purpose of being plowed under while green, or soon after maturity, to improve the soil.

Horizon, soil. A layer of soil, approximately parallel to the soil surface, with distinct characteristics produced by the soil-forming processes. Horizons are identified by letters of the alphabet.

A horizon. The horizon at the surface. It contains organic matter, or it has been leached of soluble minerals and clay, or it shows the effects of both. The major A horizon may be subdivided into A_1, the part that is darkest in color because it contains organic matter, and A_2, the part that is most leached and lightest colored in the profile. In woodlands, a layer of organic matter accumulates on top of the mineral soil; this layer is called the A_0 horizon. The depth of the soil, however, is measured from the top of the mineral soil because the A_0 horizon is rapidly destroyed if fire occurs or the soil is cultivated. Where the upper layers of the soil are thoroughly mixed by cultivation, the power layer is called the A_p horizon.

B horizon. The horizon in which clay, minerals, or other material has accumulated, or which has developed a characteristic blocky or prismatic structure, or which shows the characteristics of both processes. It may be subdivided into B_1, B_2, or B_3 horizons. The B_2 horizon may be subdivided further by adding a number to the symbol, such as B_{21}, B_{22}, or B_{23}.

C horizon. The unconsolidated material immediately under the true soil. It is presumed to be similar in chemical, physical, and mineral composition to the material from which at least part of the overlying solum has developed.

D horizon. The stratum beneath the parent material. It may be unlike the parent material of the soil. If it consists of solid rock like that from which the parent material has developed, it is designated as D_r.

Hydromorphic soil. Any intrazonal soil that occupies nearly level or depressed lowlands. These areas have very slow runoff all or part of the time and no natural erosion. Such soils retain all, or nearly all, of the water that falls as rain and, in addition, often receive a considerable amount of runoff from adjacent uplands.

Infiltration. The downward movement of water into a soil.

Leaching. The removal of materials in solution by percolating water.

Leaf mold. Partly decomposed organic forest litter.

Marine deposits. Material deposited in oceans and seas and exposed by elevation of the land or by the lowering of the water level.

Marl. An earthy deposit consisting mainly of calcium carbonate commonly mixed with clay or other impurities. It is formed chiefly at the margins of fresh-water lakes. It is commonly used for liming acid soils.

Miscellaneous land type. A mapping unit for areas of land that have little or no natural soil, or that are too nearly inaccessible for orderly examination, or that for other reasons cannot feasibly be classified as soil. Examples: Coastal beach, Local alluvial land, the Sloping and Steep sandy lands, and Tidal marsh.

Morphology, soil. The constitution of the soil, including the texture, structure, consistence, color, and other physical, chemical, and biological properties of the various soil horizons that make up the soil profile.

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms: Contrast—*faint*, *distinct*, and *prominent;* abundance—*few*, *common*, and *many;* and size—*fine*, *medium*, and *coarse*. The size measurements are: *Fine*, less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium*, ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse*, more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in the elaboration of food and tissue. Nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil, and carbon, hydrogen, and oxygen obtained largely from the air and water are plant nutrients.

Organic soil. A general term applied to a soil or to a soil horizon that consists primarily of organic matter, such as peat soils, muck soils, and peaty soil layers. *Organic*, as used in chemistry, refers to the compounds of carbon.

Organic litter. An accumulation of freshly fallen or partly decomposed leaves, needles, twigs, and bark.

Organic-mineral horizon. A soil layer that contains both organic and mineral matter, but with the mineral matter predominating.

Oxide. A compound of any element with oxygen.

Parent material. The horizon of weathered rock or partly weathered soil material from which soil has formed; horizon C in the soil profile.

Percolation. The downward movement of water through the soil, especially the downward flow of water in saturated or nearly saturated soil.

Permeability, soil. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are: *Very slow*, *slow*, *moderately slow*, *moderate*, *moderately rapid*, *rapid*, and *very rapid*.

Phase, soil. The subdivision of a soil type or other classificational unit having variations in characteristics not significant to the classification of the soil in its natural landscape but significant to the use and management of the soil. Examples of the variations recognized by phases of soil types include differences in slope, stoniness, and thickness resulting from accelerated erosion.

Pore space. The total space within soils not occupied by solid particles.

Porosity, soil. The degree to which the soil mass is permeated with pores or cavities. It is expressed as the percentage of the whole volume of the soil that is unoccupied by solid particles.

Productivity (of soil). The present capability of a soil for producing a specified plant or sequence of plants under a defined set of management practices. It is measured in terms of the outputs or harvests in relation to the inputs of production factors for a specific kind of soil under a physically defined system of management.

Profile, soil. A vertical section of the soil through all of its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of the soil mass, expressed in pH values or in words, as follows:

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher.

Relief. The elevations or inequalities of the land surface, considered collectively.

Sand. Individual rock or mineral fragments in soils ranging in diameter from 0.05 millimeter to 2.0 millimeters. Usually sand grains consist chiefly of quartz, but they may be of any mineral composition. (See Texture, soil.)

Series, soil. A group of soils that have soil horizons similar in their differentiating characteristics and arrangement in the soil profile, except for the texture of the surface soil, and are formed from a particular type of parent material. The soil series is an important category in detailed soil classification.

Silt. (1) Individual mineral particles of soil that range in diameter between the upper size of clay, 0.002 millimeter, and the lower size of very fine sand, 0.05 millimeter. (2) Sediment deposited from water in which the individual grains are approximately the size of silt, although the term is sometimes applied loosely to sediment containing considerable sand and clay. (See Texture, soil.)

Slope, soil. The incline of the surface of a soil area. It is usually expressed in percent, which equals the vertical distance divided by the horizontal distance times 100, or the number of feet of fall per 100 feet of horizontal distance.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting upon parent material, as conditioned by relief over periods of time.

Solum. The upper part of the soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying parent material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Stratified. Composed of, or arranged in, strata, or layers, such as stratified alluvium. The term is confined to geological material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are: *Platy* (faces mostly horizontal); *prismatic* (without rounded caps); *columnar* (with rounded caps); *angular blocky* (faces flattened, most vertices sharply angular); *subangular blocky* (mixed rounded and flattened faces with many rounded vertices); *granular* (relatively nonporous peds); and *crumb* (porous peds). Structureless soils are (1) *single grain*—each grain by itself, as in dune sand, or (2) *massive*—the particles adhering together without any regular cleavage as in many claypans and hardpans.

Subsoil. Technically, the B horizon of soils with distinct profiles; roughly, that part of the profile below plow depth.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace (geological). A nearly level or undulating plain, commonly rather narrow and usually with a steep front, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of the various size groups of individual soil grains in a mass of soil. Specifically, it refers to the proportions of sand, silt, and clay. Verbal definitions of the soil textural classes are as follows:

Sand. Soil material that contains 85 percent or more sand; percentage of silt, plus 1½ times the percentage of clay, shall not exceed 15.

Loamy sand. Soil material that contains at the upper limit 85 to 90 percent sand, and the percentage of silt plus 1½ times the percentage of clay is not less than 15; at the lower limit it contains not less than 70 to 85 percent sand, and the percentage of silt plus twice the percentage of clay does not exceed 30.

Sandy loam. Soil material that contains either 20 percent clay or less, and the percentage of silt plus twice the percentage of clay exceeds 30, and 52 percent or more sand; or less than 7 percent clay, less than 50 percent silt, and between 43 percent and 52 percent sand.

Loam. Soil material that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand.

Silt loam. Soil material that contains (1) 50 percent or more of silt, and 12 to 27 percent of clay or (2) 50 to 80 percent of silt and less than 12 percent of clay.

Silt. Soil material that contains 80 percent or more of silt and less than 12 percent clay.

Sandy clay loam. Soil material that contains 20 to 35 percent clay, less than 28 percent silt, and 45 percent or more sand.

Clay loam. Soil material that contains 27 to 40 percent clay and 20 to 45 percent sand.

Silty clay loam. Soil material that contains 27 to 40 percent clay and less than 20 percent sand.

Sandy clay. Soil material that contains 35 percent or more clay and 45 percent or more sand.

Silty clay. Soil material that contains 40 percent or more clay and 40 percent or more silt.

Clay. Soil material that contains 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Gravelly loam. A loam soil material that contains from 20 to 50 percent of gravel in the whole soil mass. Gravel is fragments of rocks up to 3 inches in diameter.

Gravelly clay loam. A clay loam soil material altered by a content of about 20 percent or more gravel in the whole soil mass.

Topsoil (engineering). A presumed fertile soil or soil material, usually rich in organic matter, used to topdress roadbanks, lawns, and gardens to promote the growth of vegetation.

Type, soil. A subdivision of the soil series based on the texture of the surface layer.

Water-holding capacity. The ability of a soil to hold water that will not drain away but can be taken up by plant roots.

Watershed. The total land area, regardless of size, above a given point on a waterway that contributes runoff water to the flow at that point.

Water table. The upper limit of the part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

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GUIDE TO MAPPING UNITS AND CAPABILITY UNITS

Map symbol	*Soil name*	*Page*	*Capability unit*	
			Symbol	*Page*
BeA	Beltsville very fine sandy loam, nearly level	6	IIIs–2	27
BeB	Beltsville very fine sandy loam, gently sloping	6	IIIs–2	27
BeB2	Beltsville very fine sandy loam, gently sloping, eroded	6	IIIs–2	27
Br	Bertie silt loam	6	IIw–2	25
Bt	Bladen silt loam	7	IIIw–2	26
CaC3	Caroline clay loam, sloping, severely eroded	8	VIe–1	27
CaD3	Caroline clay loam, strongly sloping, severely eroded	8	VIIe–1	28
CfB2	Caroline very fine sandy loam, gently sloping, eroded	7	IIe–2	24
CfC2	Caroline very fine sandy loam, sloping, eroded	8	IVe–1	27
Co	Coastal beach	8	VIIIw–1	28
CrD3	Craven clay loam, strongly sloping, severely eroded	9	VIIe–1	28
CsA	Craven silt loam, nearly level	8	IIw–3	25
CsB2	Craven silt loam, gently sloping, eroded	9	IIe–2	24
CsC2	Craven silt loam, sloping, eroded	9	IVe–1	27
Dr	Dragston fine sandy loam	9	IIw–2	25
Ek	Elkton silt loam	9	IIIw–2	26
Fa	Fallsington fine sandy loam	10	IIIw–1	26
KeA	Kempsville fine sandy loam, nearly level	10	I–1	24
KeB	Kempsville fine sandy loam, gently sloping	11	IIe–1	24
KeB2	Kempsville fine sandy loam, gently sloping, eroded	11	IIe–1	24
KeC2	Kempsville fine sandy loam, sloping, eroded	11	IIIe–1	26
KeC3	Kempsville fine sandy loam, sloping, severely eroded	11	IVe–1	27
LaB	Lakeland loamy fine sand, gently sloping	11	IIIs–1	27
Le	Lenoir silt loam	12	IIIw–2	26
Lo	Local alluvial land	12	IIw–1	25
MaA	Matapeake silt loam, nearly level	13	I–1	24
MaB	Matapeake silt loam, gently sloping	13	IIe–1	24
MaB2	Matapeake silt loam, gently sloping, eroded	13	IIe–1	24
MaC2	Matapeake silt loam, sloping, eroded	13	IIIe–1	26
MaD2	Matapeake silt loam, strongly sloping, eroded	13	IVe–1	27
Mt	Mattapex silt loam	14	IIw–1	25
Mx	Mixed alluvial land	14	VIw–1	28
Ot	Othello silt loam	14	IIIw–1	26
RtB	Rumford loamy sand, thick surface, gently sloping	15	IIIs–1	27
RuB	Rumford loamy sand, gently sloping	15	IIs–1	25
RuC2	Rumford loamy sand, sloping, eroded	15	IIIe–1	26
SaA	Sassafras fine sandy loam, nearly level	15	I–1	24
SaB	Sassafras fine sandy loam, gently sloping	16	IIe–1	24
SaB2	Sassafras fine sandy loam, gently sloping, eroded	16	IIe–1	24
SaC2	Sassafras fine sandy loam, sloping, eroded	16	IIIe–1	26
SaC3	Sassafras fine sandy loam, sloping, severely eroded	16	IVe–1	27
SaD2	Sassafras fine sandy loam, strongly sloping, eroded	16	IVe–1	27
SaD3	Sassafras fine sandy loam, strongly sloping, severely eroded	16	VIe–1	27
SfA	Sassafras loamy fine sand, thick surface, nearly level	17	IIs–1	25
SfB	Sassafras loamy fine sand, thick surface, gently sloping	17	IIs–1	25
SsD	Sloping sandy land	17	VIe–2	28
StE	Steep sandy land	17	VIIe–2	28
Th	Tidal marsh, high	17	VIIIw–1	28
To	Tidal marsh, low	18	VIIIw–1	28
Wo	Woodstown fine sandy loam	18	IIw–1	25

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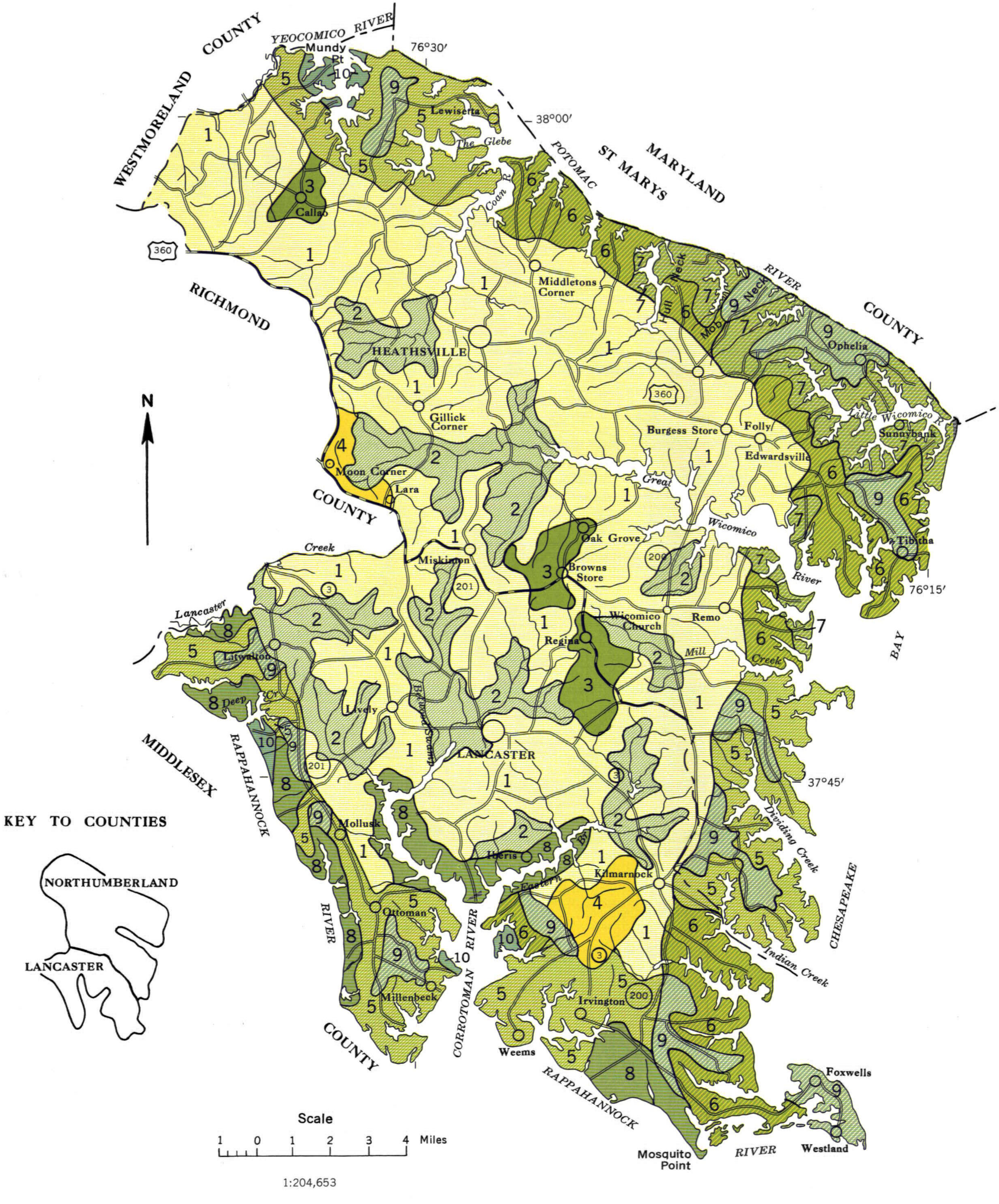
GENERAL SOIL MAP
NORTHUMBERLAND AND LANCASTER COUNTIES, VIRGINIA



SOIL ASSOCIATIONS

DEEP, MEDIUM-TEXTURED SOILS ON RIDGES AND VARIABLE SANDY SOILS ON STEEP SLOPES

1 Sassafras-Sandy land Association

2 Sandy land-Sassafras-Mixed alluvial land Association

3 Beltsville-Kempsville Association

4 Kempsville-Sassafras-Sandy land Association

NEARLY LEVEL SOILS OF VARIABLE TEXTURE AND DRAINAGE IN BROAD, FLAT AREAS ALONG COASTAL BAYS

5 Woodstown-Dragston Association

6 Mattapex-Bertie Association

7 Matapeake-Mattapex Association

8 Sassafras, thick surface phases-Woodstown Association

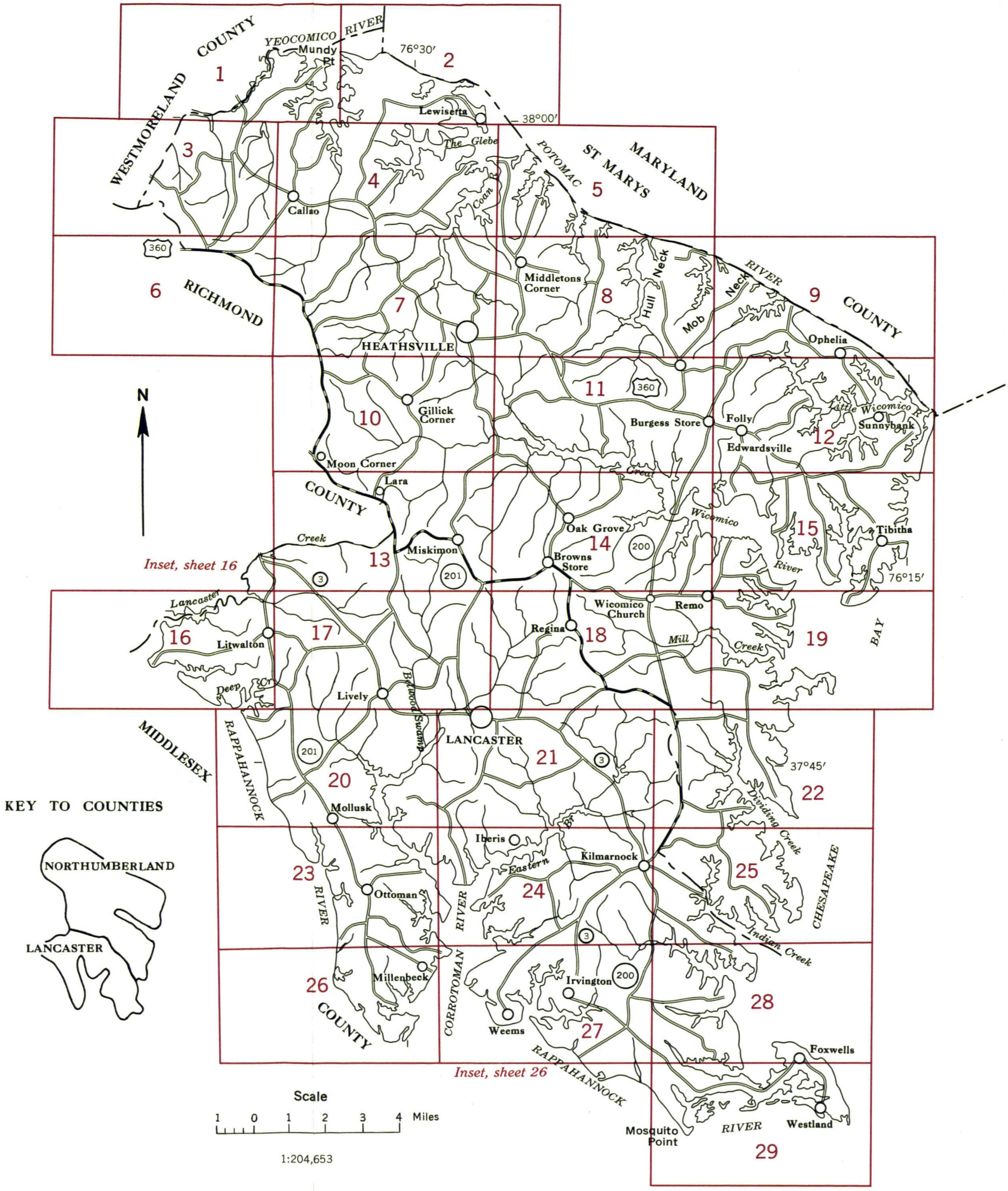
NEARLY LEVEL, POORLY DRAINED SOILS, MAINLY OF FINE TEXTURE

9 Othello-Fallsington Association

10 Craven-Lenoir Association

INDEX TO MAP SHEETS

NORTHUMBERLAND AND LANCASTER COUNTIES, VIRGINIA



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

NORTHUMBERLAND AND LANCASTER COUNTIES, VIRGINIA

VIRGINIA AGRICULTURAL EXPERIMENT STATION

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, or E, shows the slope. Symbols without a slope letter are those of nearly level soils, such as Elkton silt loam, or of land types such as Coastal beach. Soils that are eroded have a final number, 2 or 3, in their symbol.

SYMBOL	NAME
BeA	Beltsville very fine sandy loam, nearly level
BeB	Beltsville very fine sandy loam, gently sloping
BeB2	Beltsville very fine sandy loam, gently sloping, eroded
Br	Bertie silt loam
Bt	Bladen silt loam
CaC3	Caroline clay loam, sloping, severely eroded
CaD3	Caroline clay loam, strongly sloping, severely eroded
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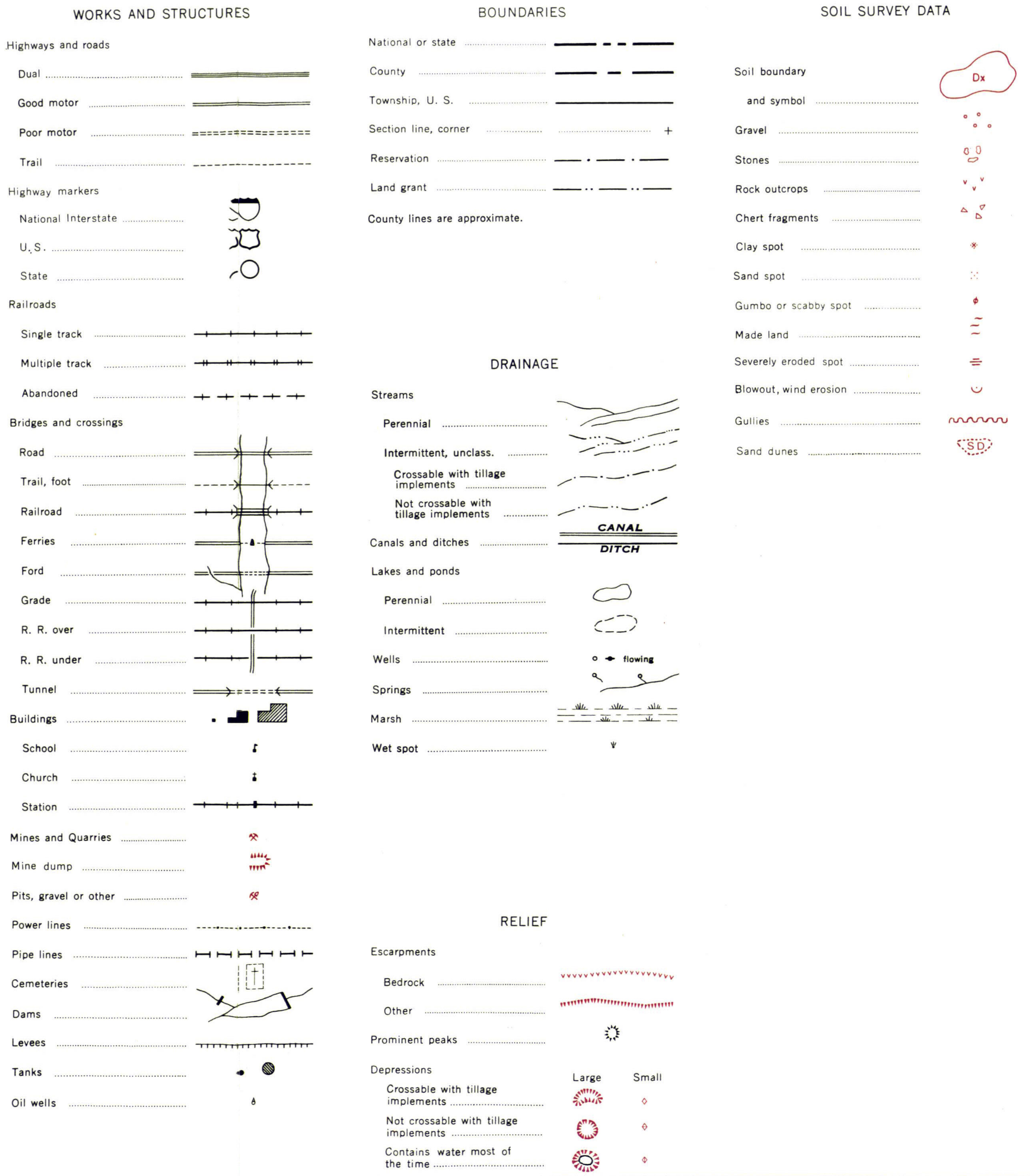
SaC3	Sassafras fine sandy loam, sloping, severely eroded
SaD2	Sassafras fine sandy loam, strongly sloping, eroded
SaD3	Sassafras fine sandy loam, strongly sloping, severely eroded
SfA	Sassafras loamy fine sand, thick surface, nearly level
SfB	Sassafras loamy fine sand, thick surface, gently sloping
SsD	Sloping sandy land
StE	Steep sandy land
Th	Tidal marsh, high
To	Tidal marsh, low
Wo	Woodstown fine sandy loam

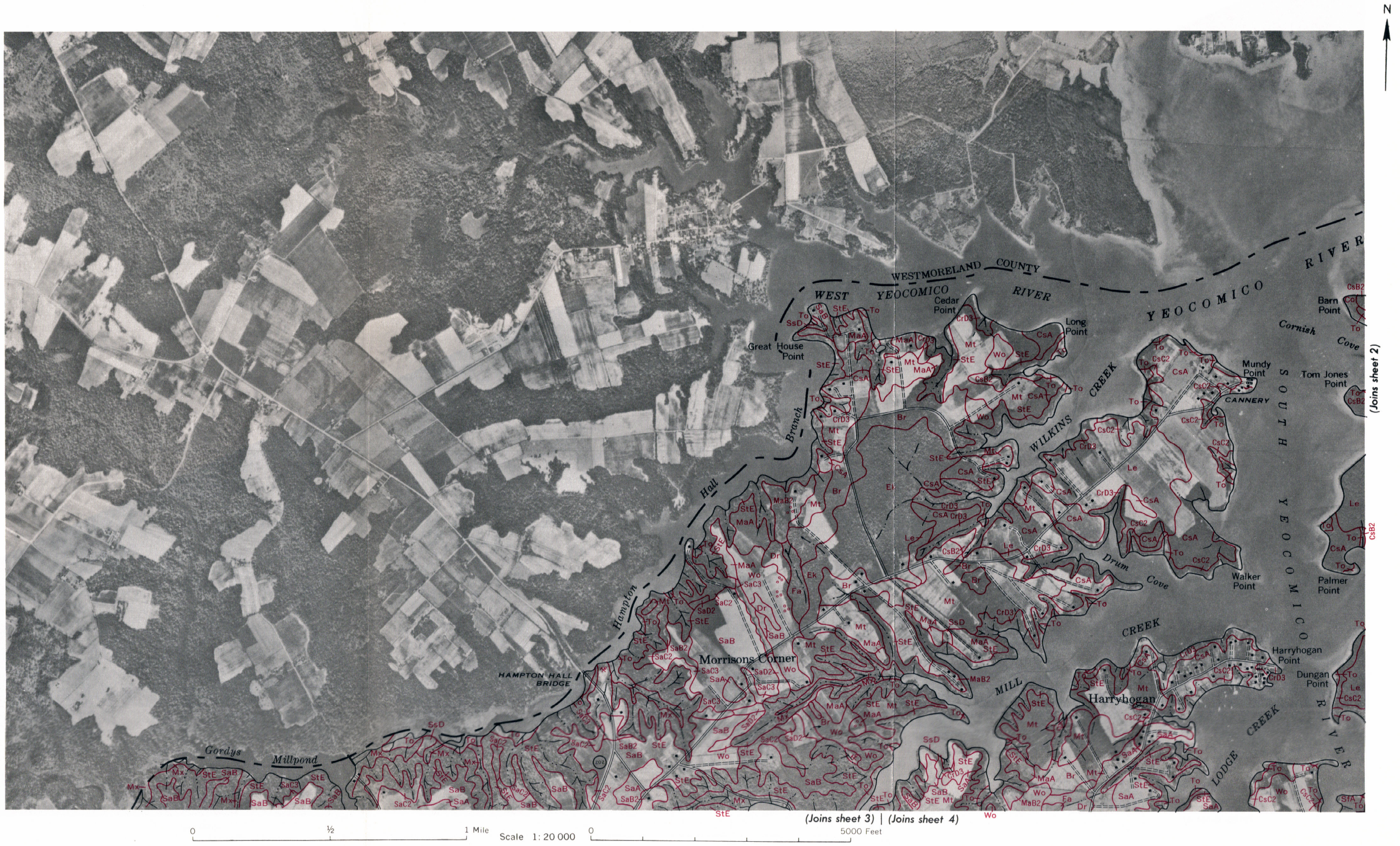
Soil map constructed 1962 by Cartographic Division, Soil Conservation Service, USDA, from 1953 aerial photographs. Controlled mosaic based on Virginia plane coordinate system, south zone, Lambert conformal conic projection, North American datum.

CONVENTIONAL SIGNS



NORTHUMBERLAND AND LANCASTER COUNTIES, VIRGINIA — SHEET NUMBER 1

This is one of a set of maps prepared by the Soil Conservation Service, U. S. Department of Agriculture, for a soil survey report of this area. For information regarding the complete soil survey report, write the Soil Conservation Service, U. S. Department of Agriculture, Washington 25, D. C. This map compiled from aerial photographs flown in 1953.



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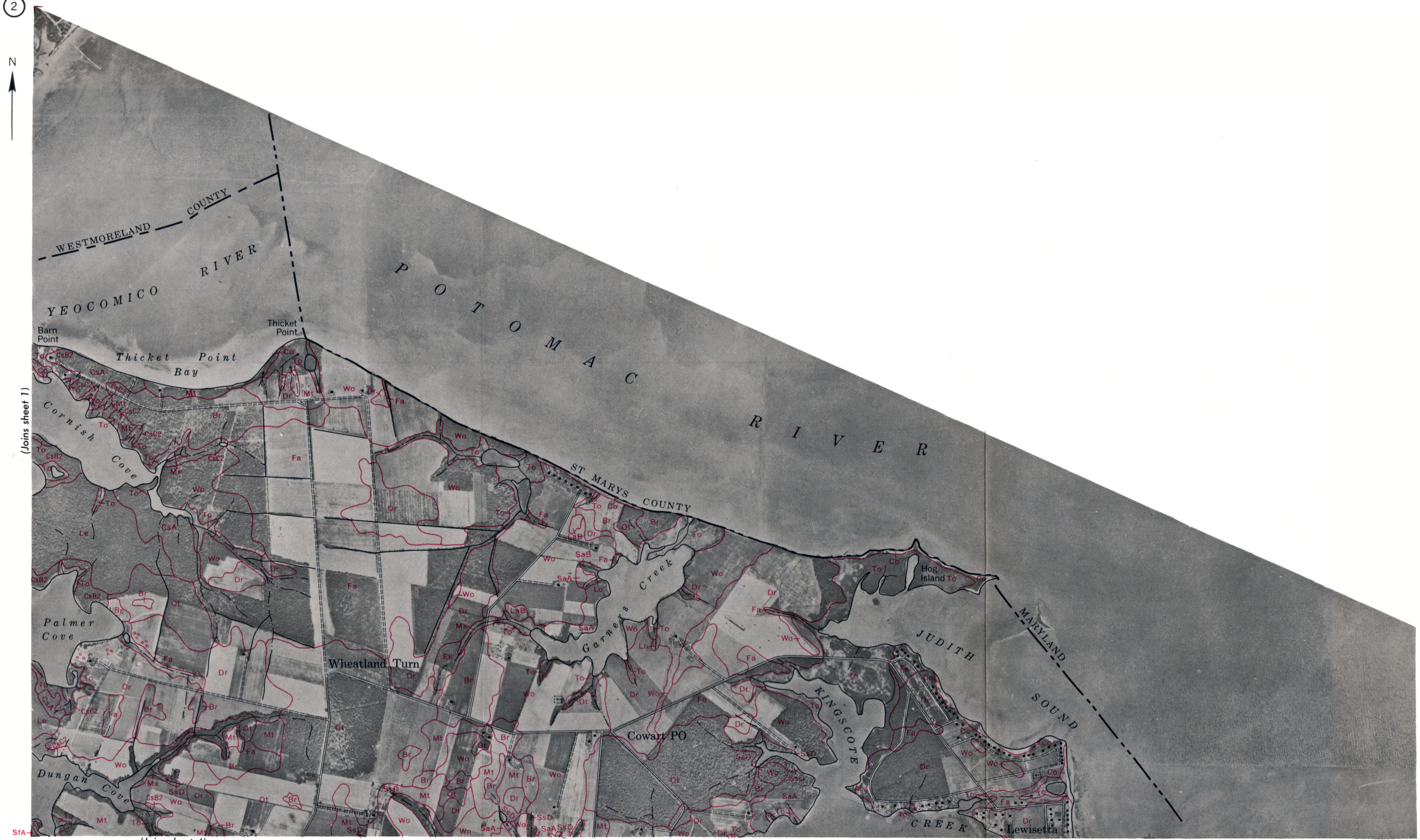

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NORTHUMBERLAND AND LANCASTER COUNTIES, VIRGINIA — SHEET NUMBER 3

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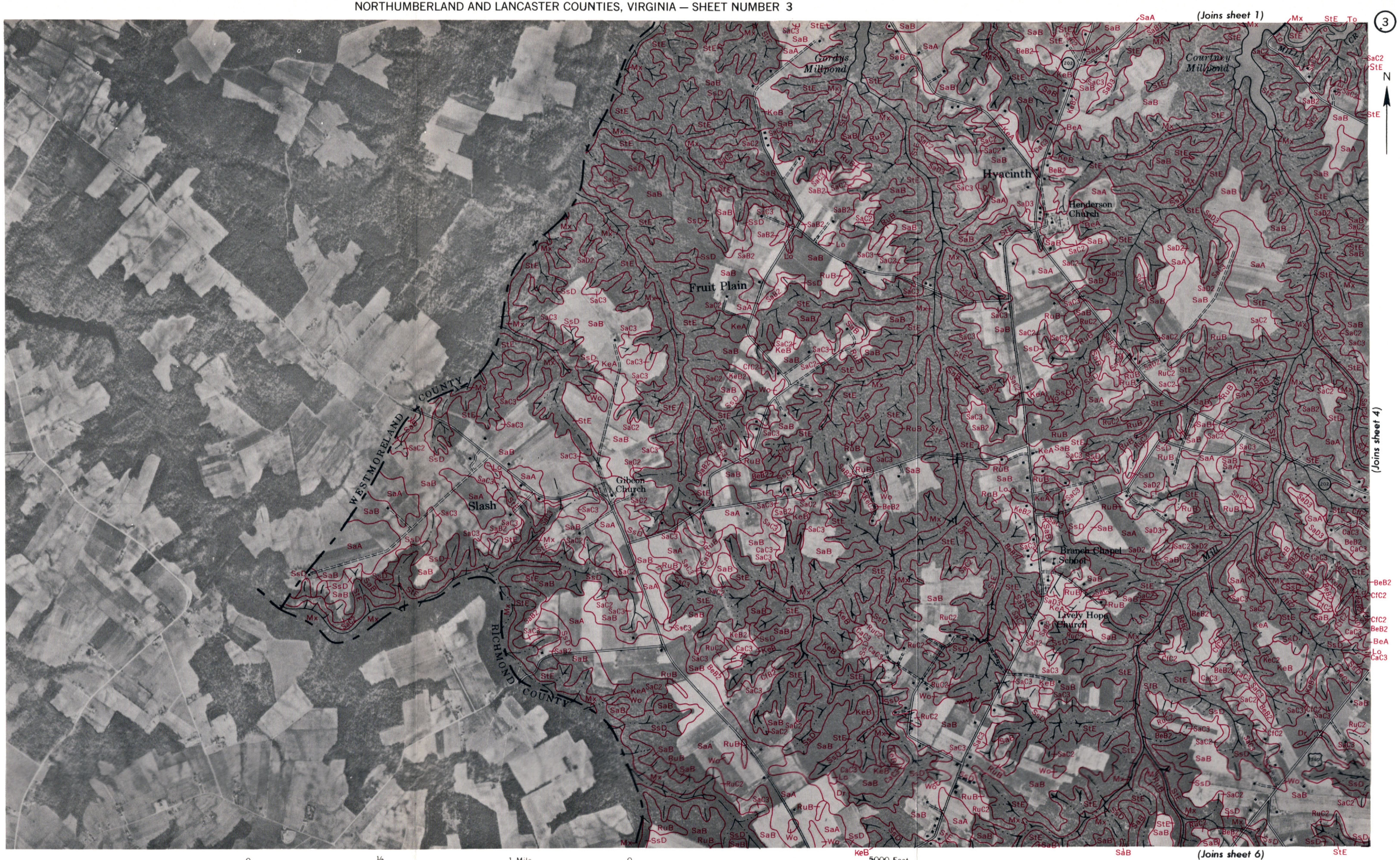

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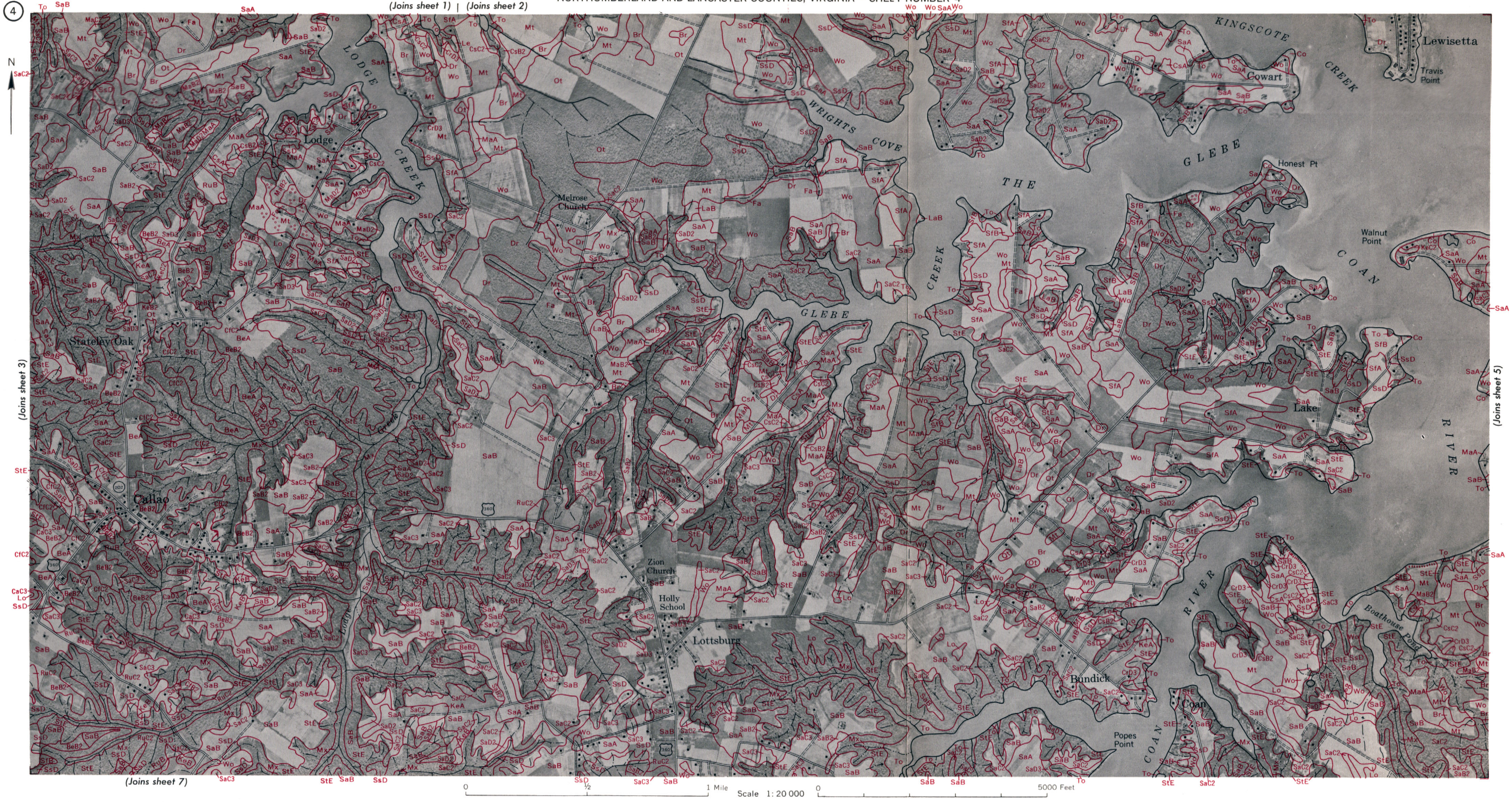
NORTHUMBERLAND AND LANCASTER COUNTIES, VIRGINIA — SHEET NUMBER 4



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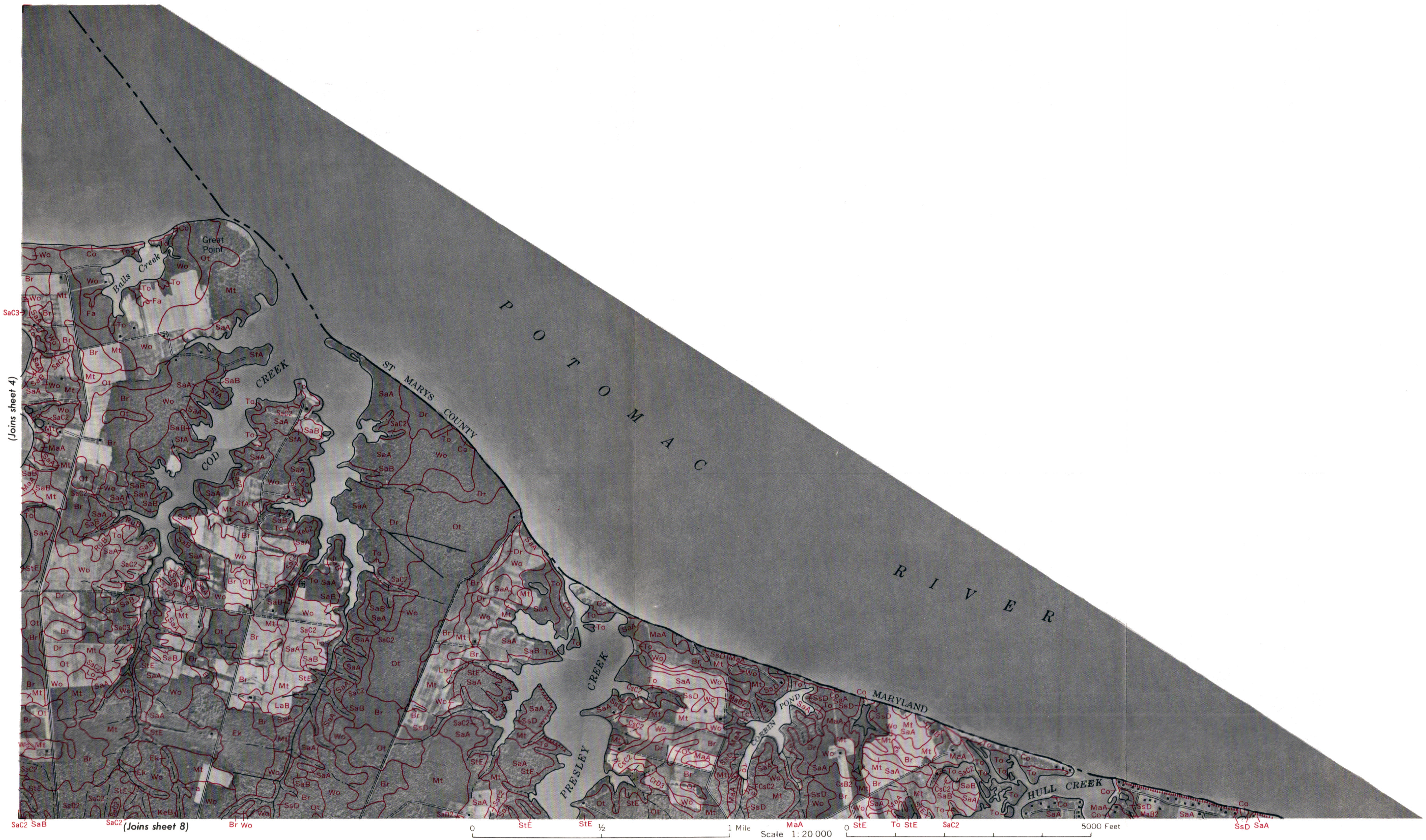

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NORTHUMBERLAND AND LANCASTER COUNTIES, VIRGINIA — SHEET NUMBER 6

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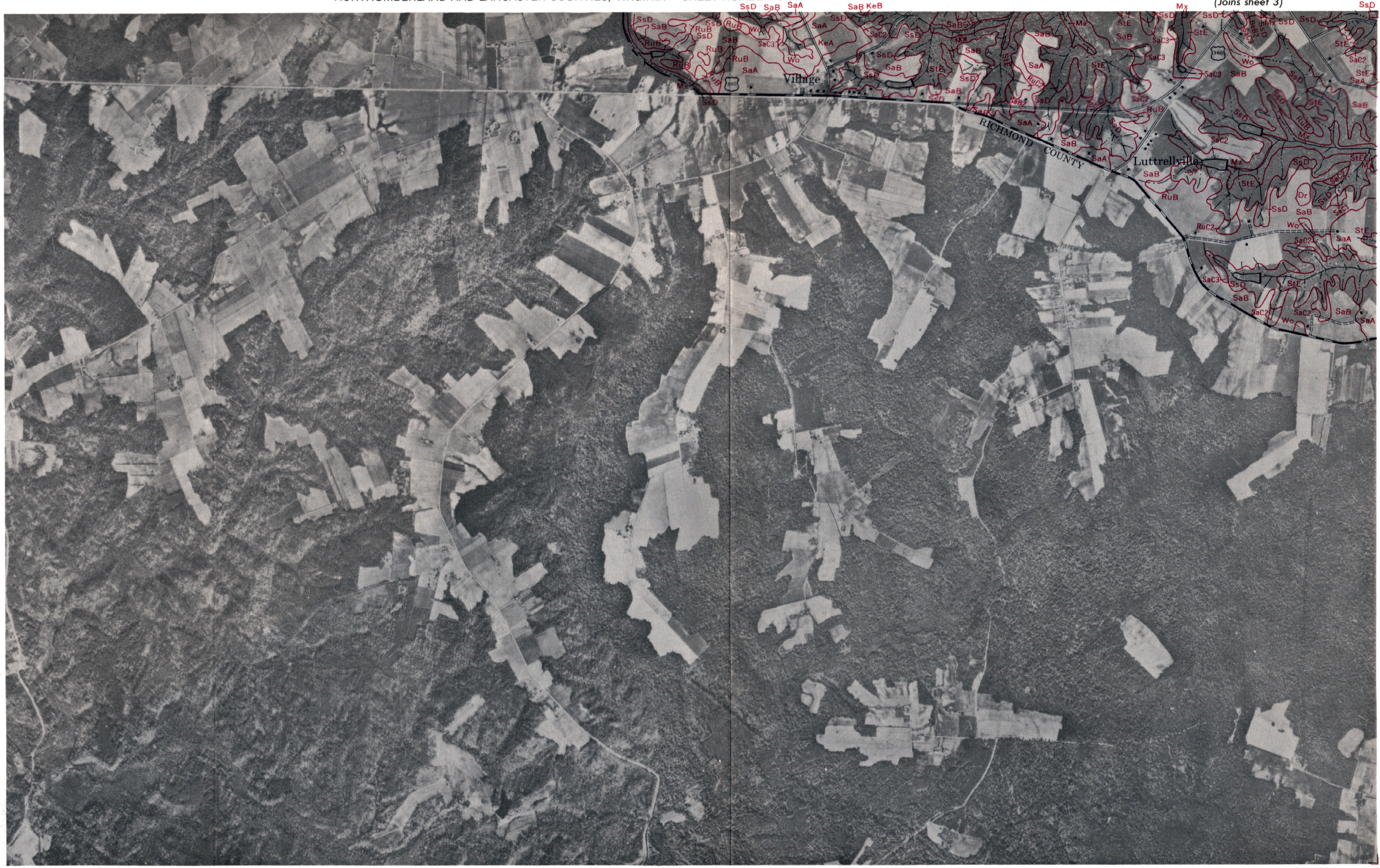

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NORTHUMBERLAND AND LANCASTER COUNTIES, VIRGINIA — SHEET NUMBER 8

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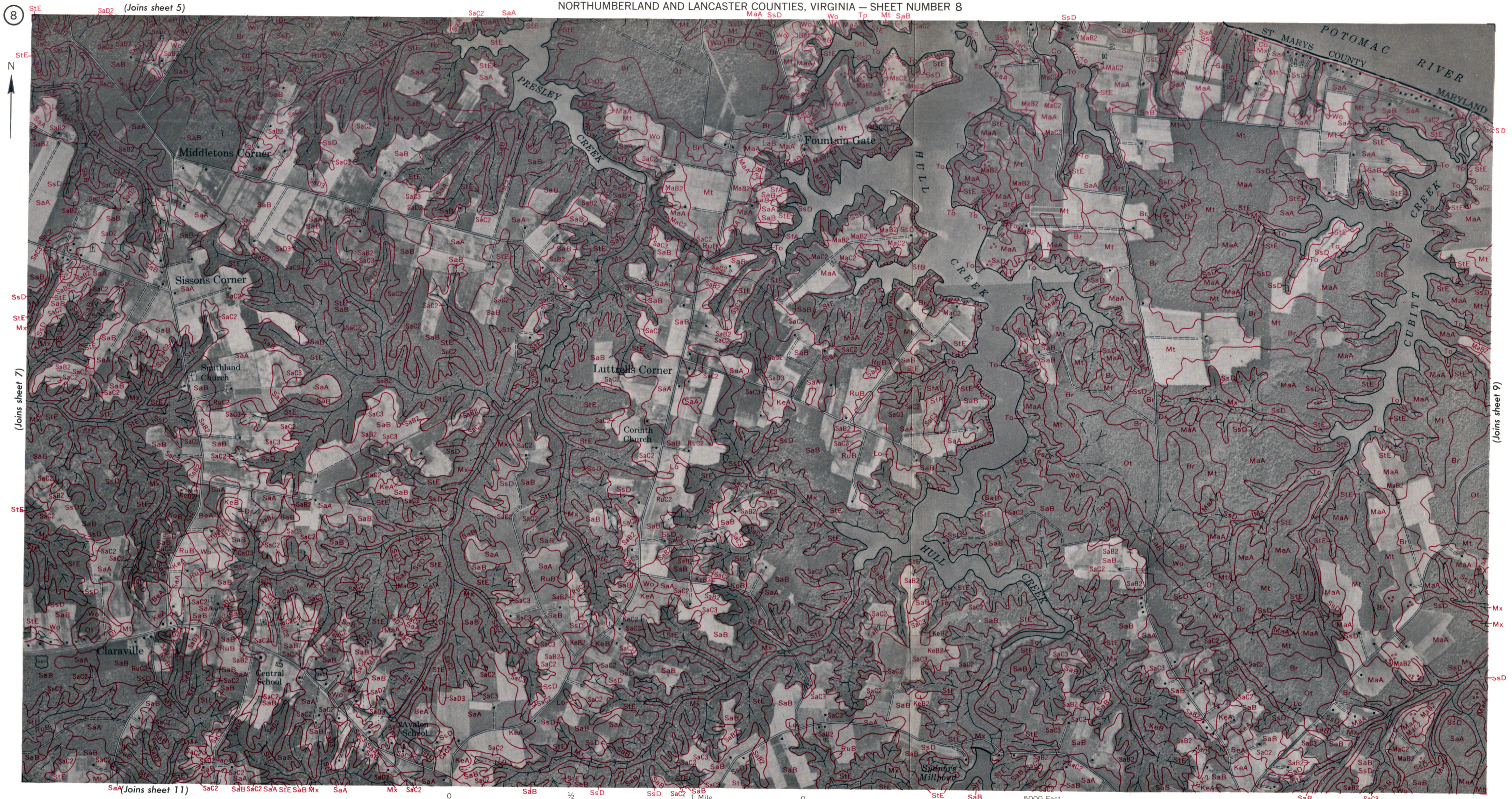

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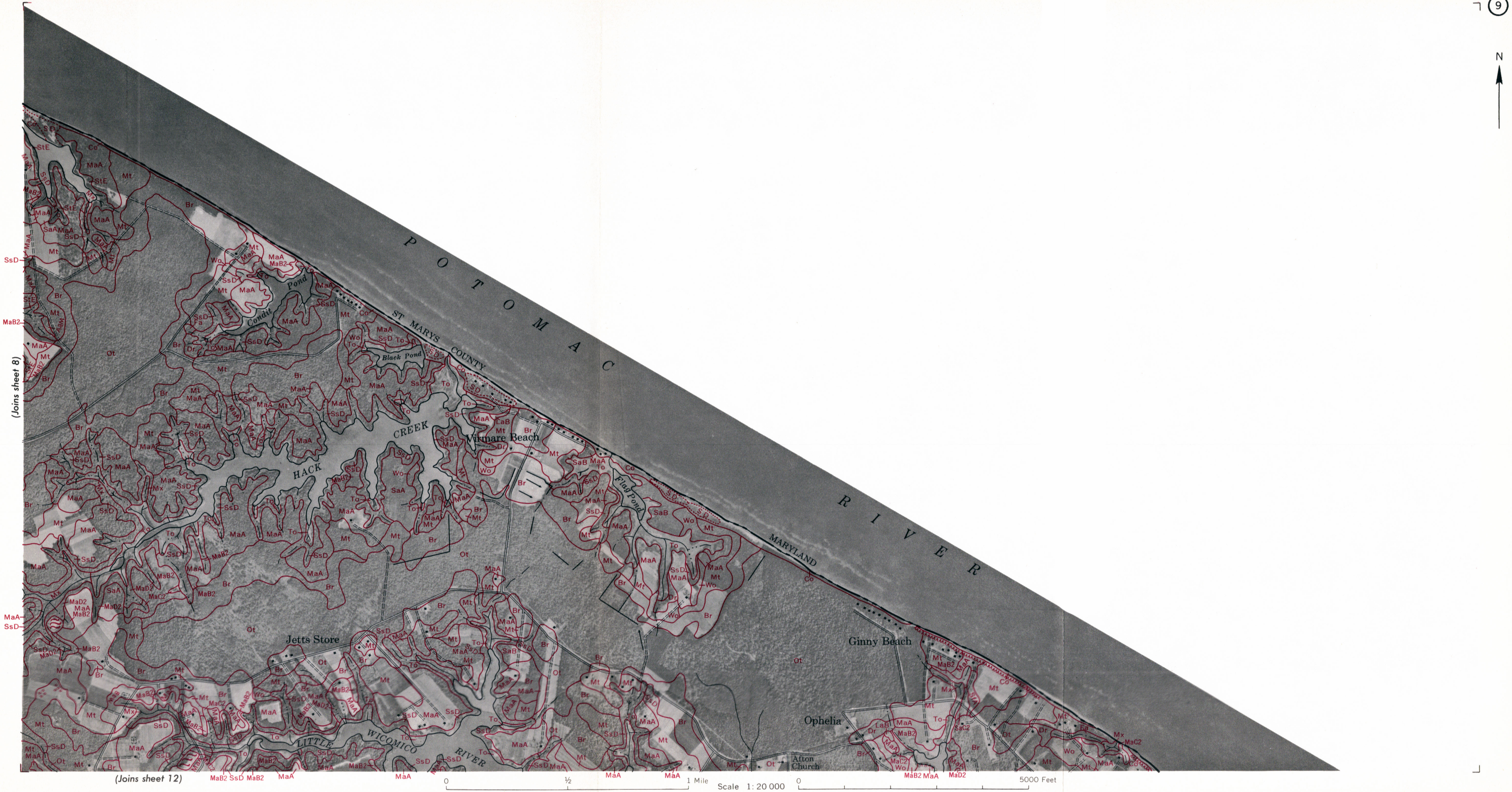

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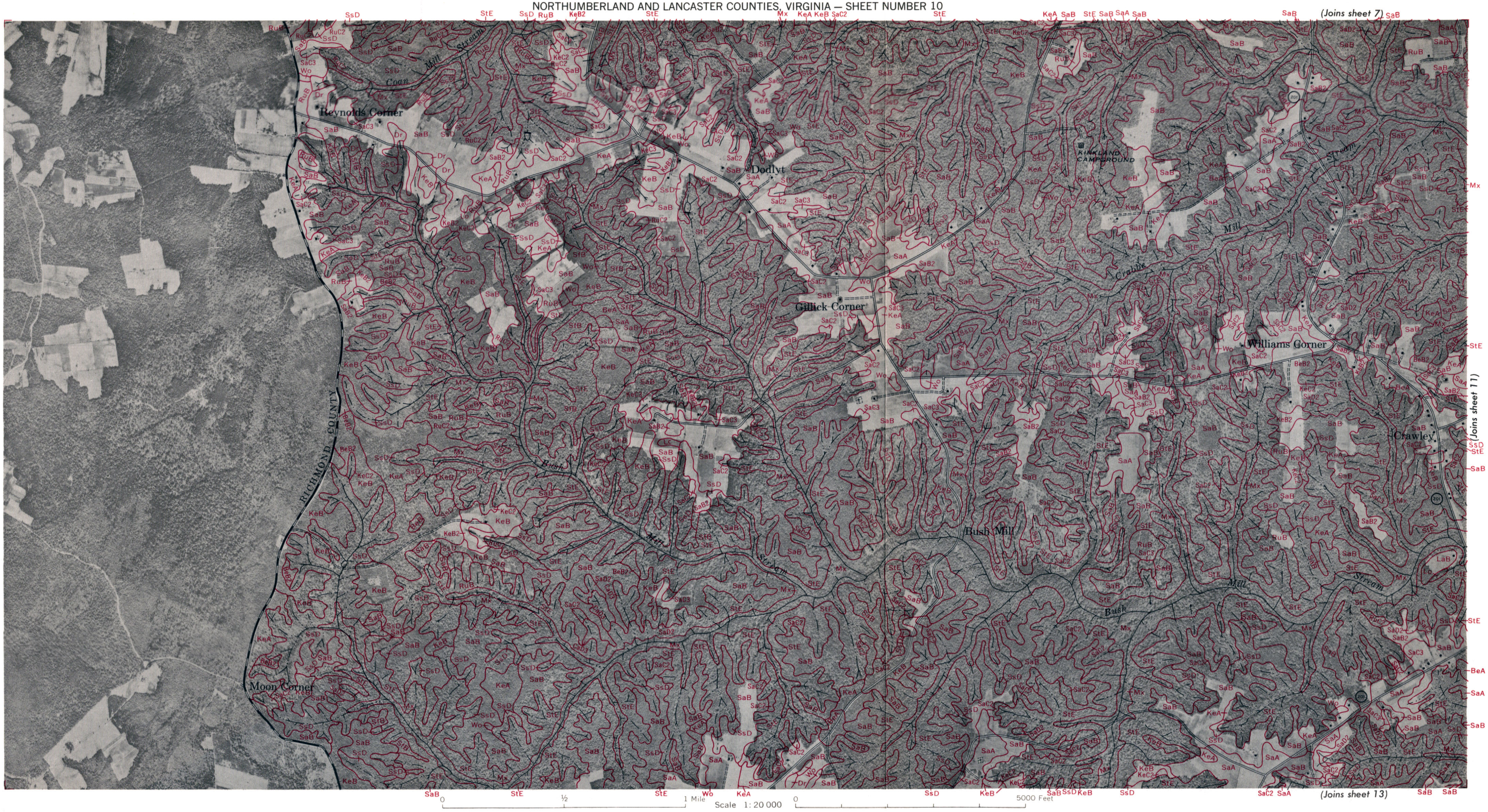

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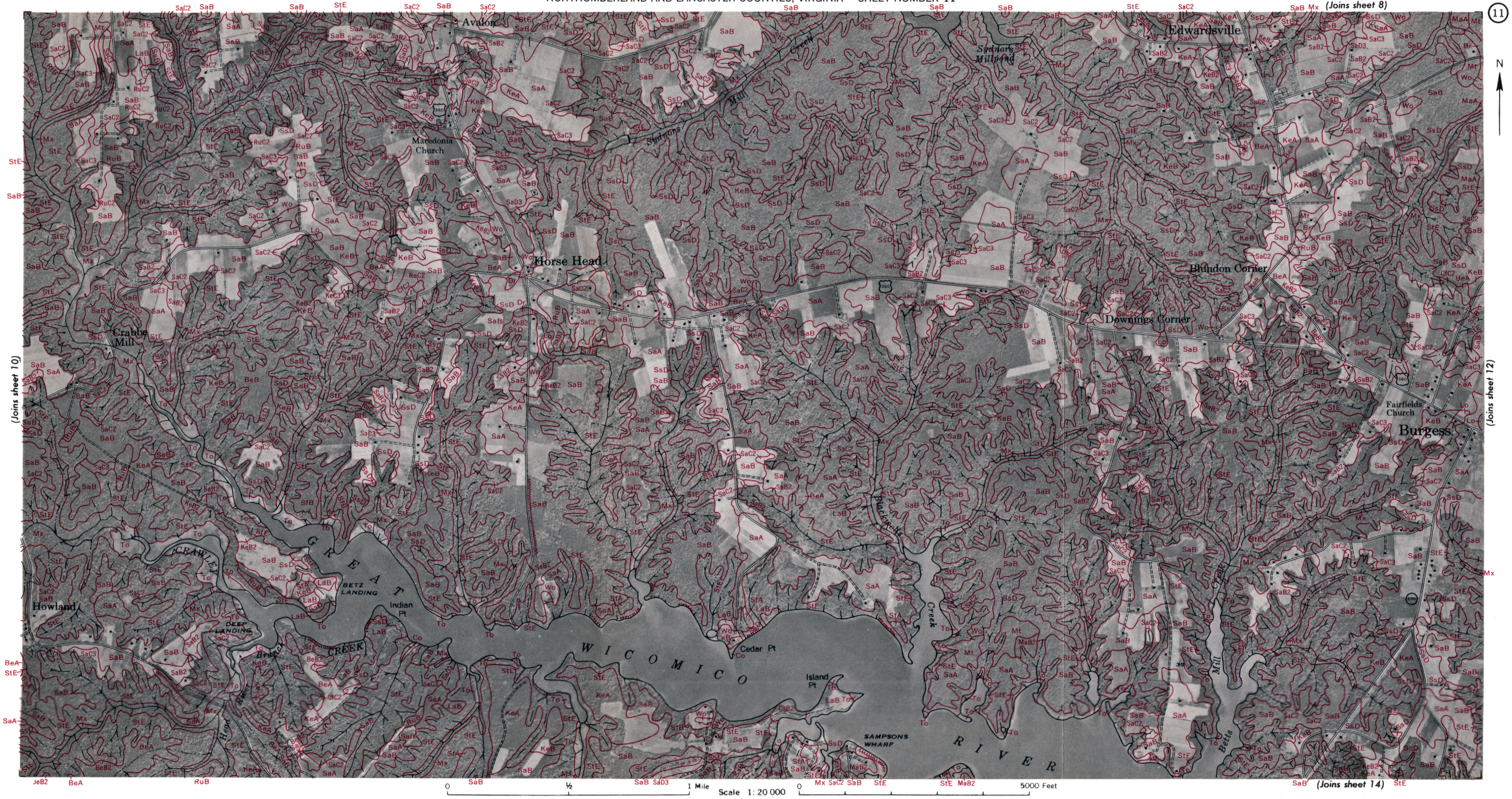

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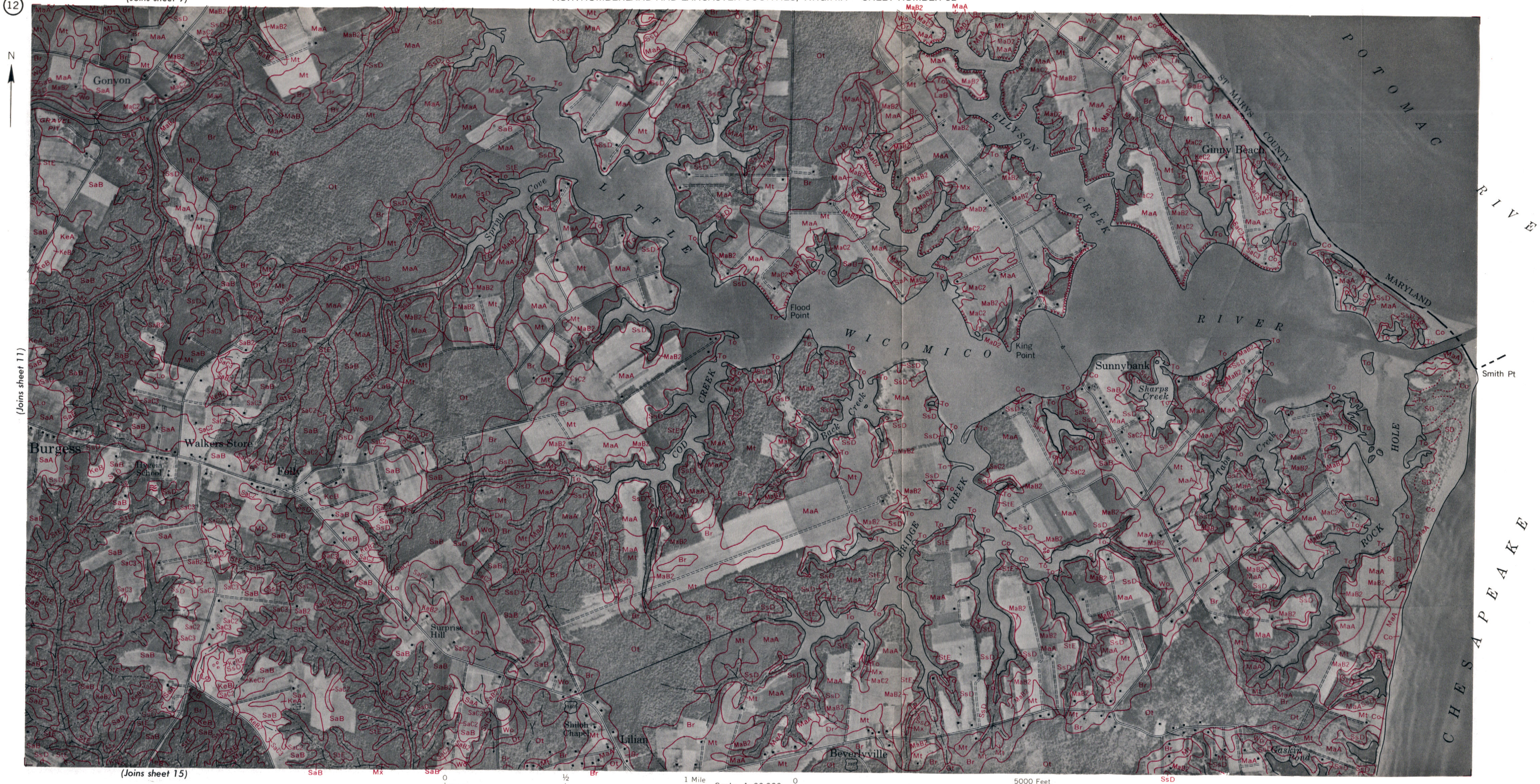

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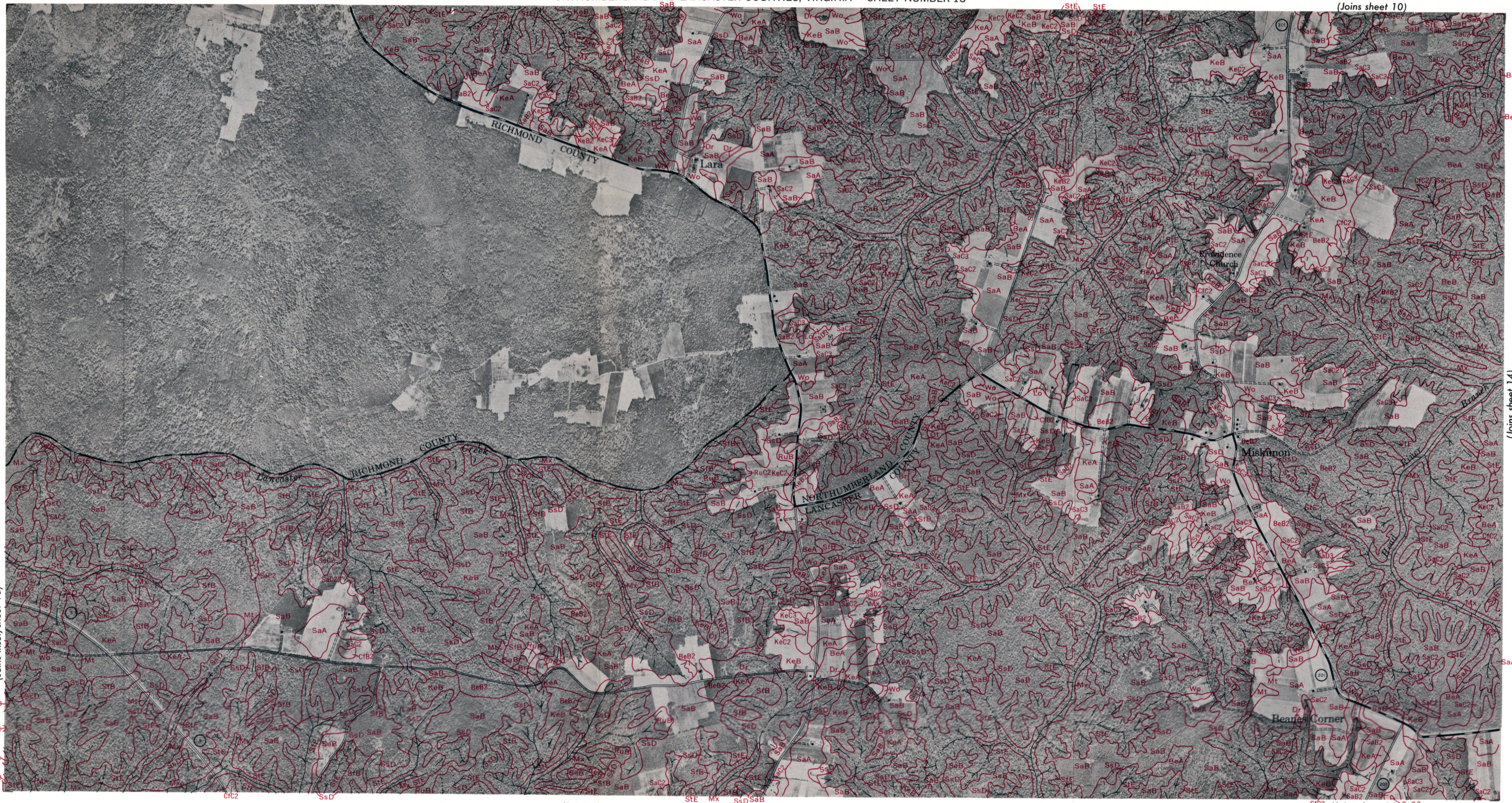

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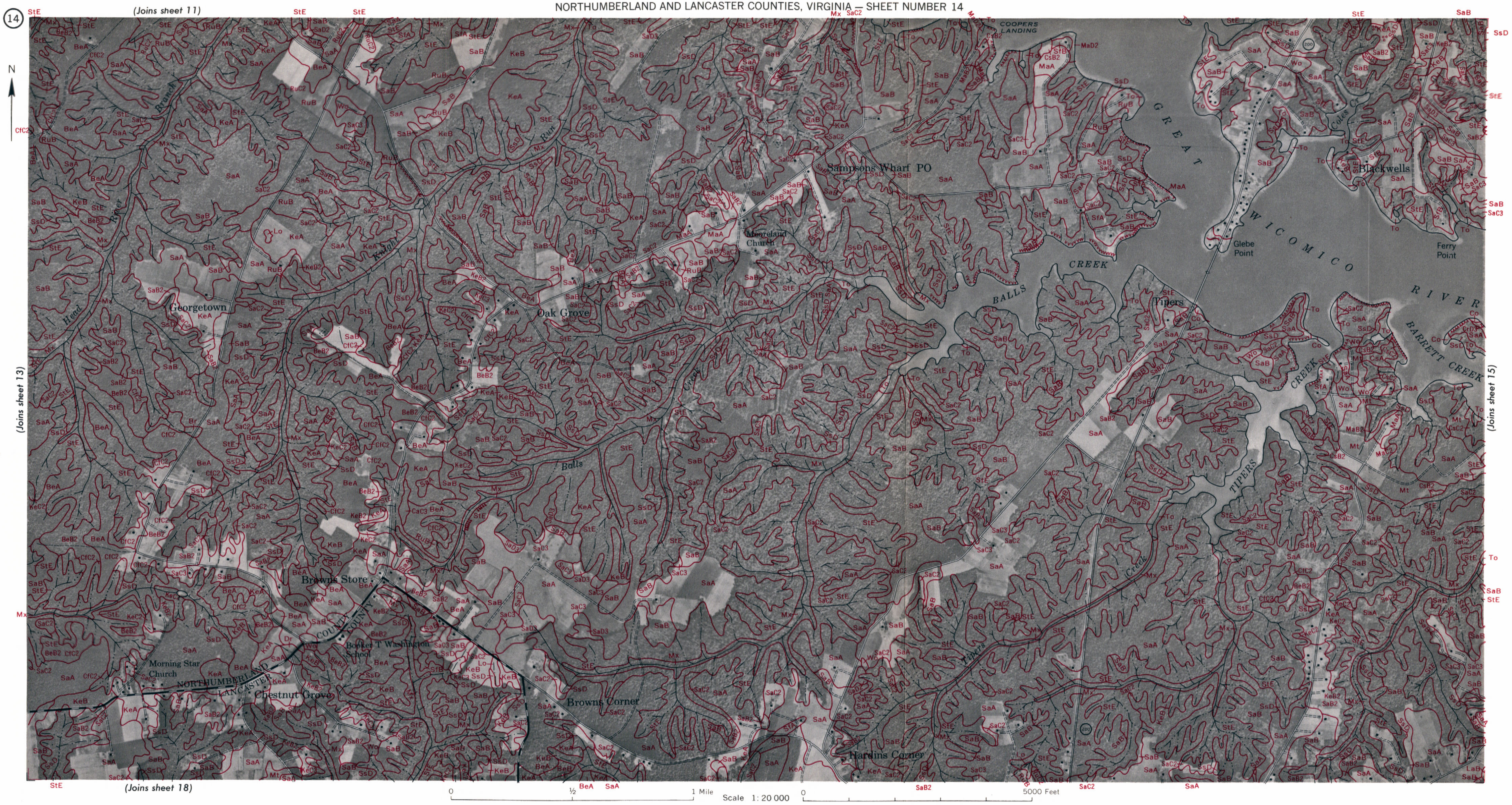
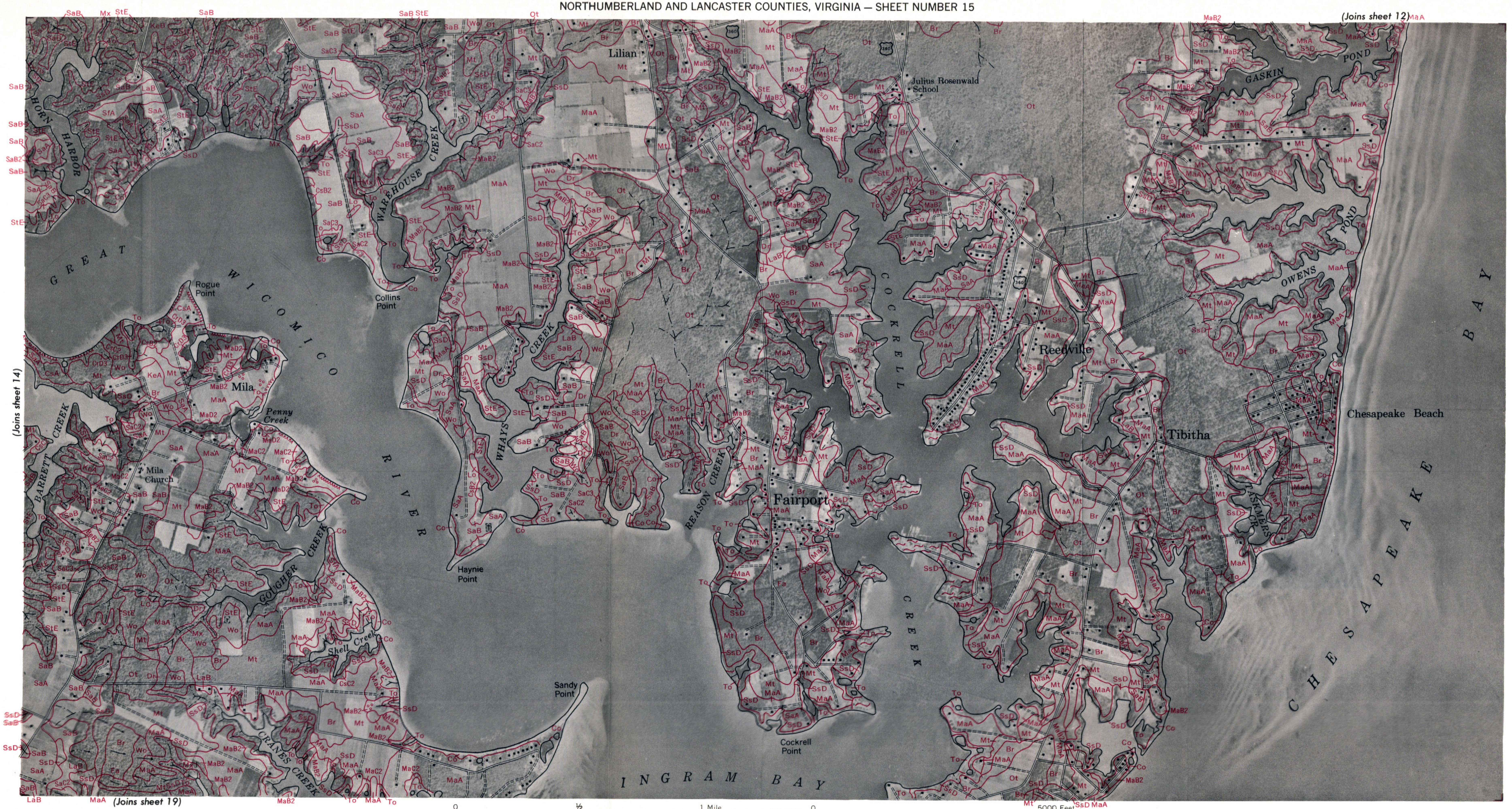
0 5000 Feet

NORTHUMBERLAND AND LANCASTER COUNTIES, VIRGINIA — SHEET NUMBER 14



NORTHUMBERLAND AND LANCASTER COUNTIES, VIRGINIA — SHEET NUMBER 15

This is one of a set of maps prepared by the Soil Conservation Service, U. S. Department of Agriculture, for a soil survey report of this area. For information regarding the complete soil survey report, write the Soil Conservation Service, U. S. Department of Agriculture, Washington 25, D. C. This map compiled from aerial photographs flown in 1953.



Scale 1: 20 000

0 ½ 1 Mile

0 5000 Feet

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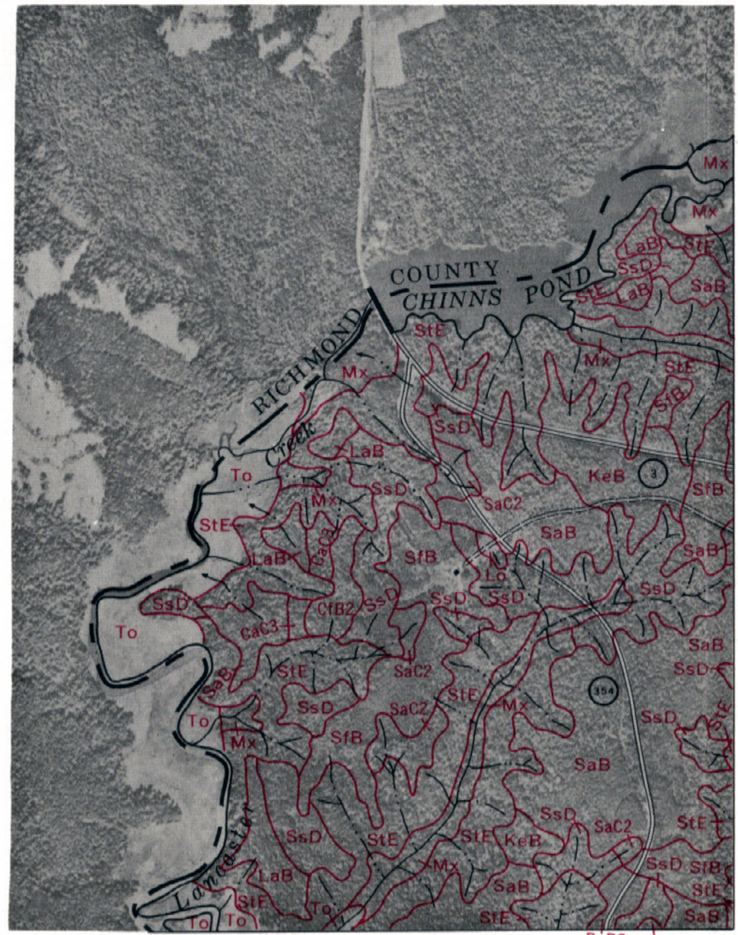
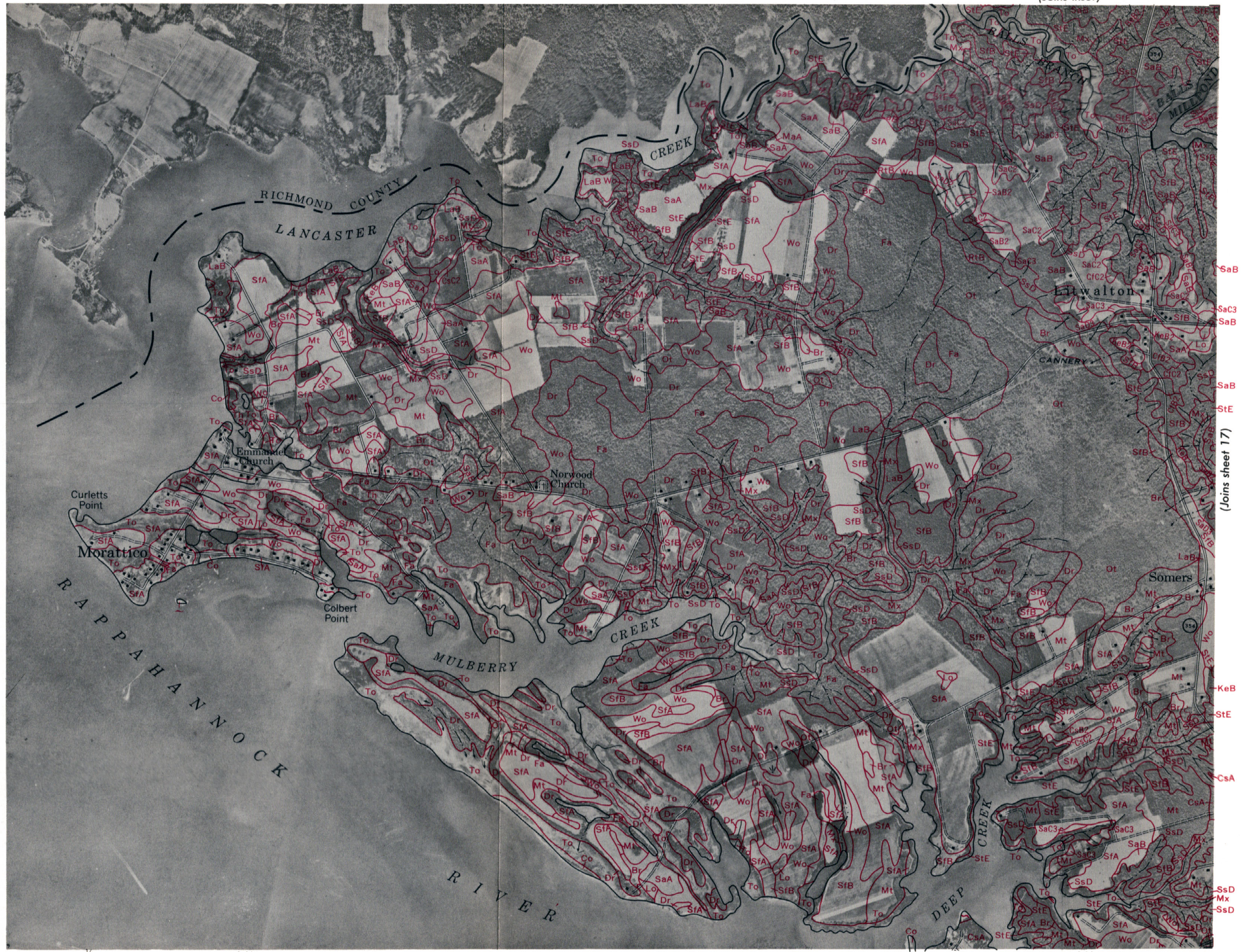
N

NORTHUMBERLAND AND LANCASTER COUNTIES, VIRGINIA — SHEET NUMBER 16



(Joins upper right)

(Joins inset)



(Joins sheet 17)

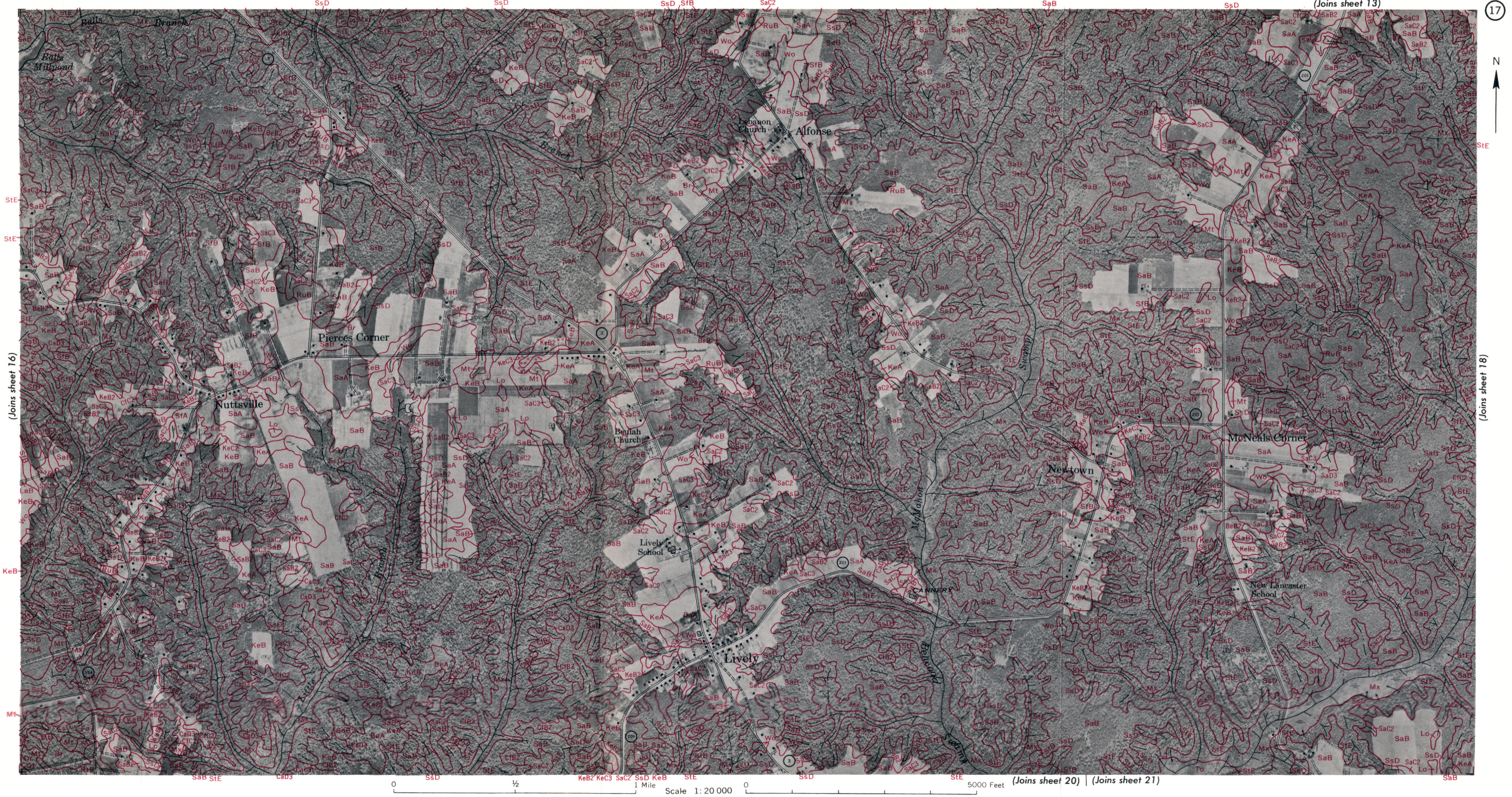
(Joins sheet 20)

0 ½ 1 Mile

Scale 1: 20 000

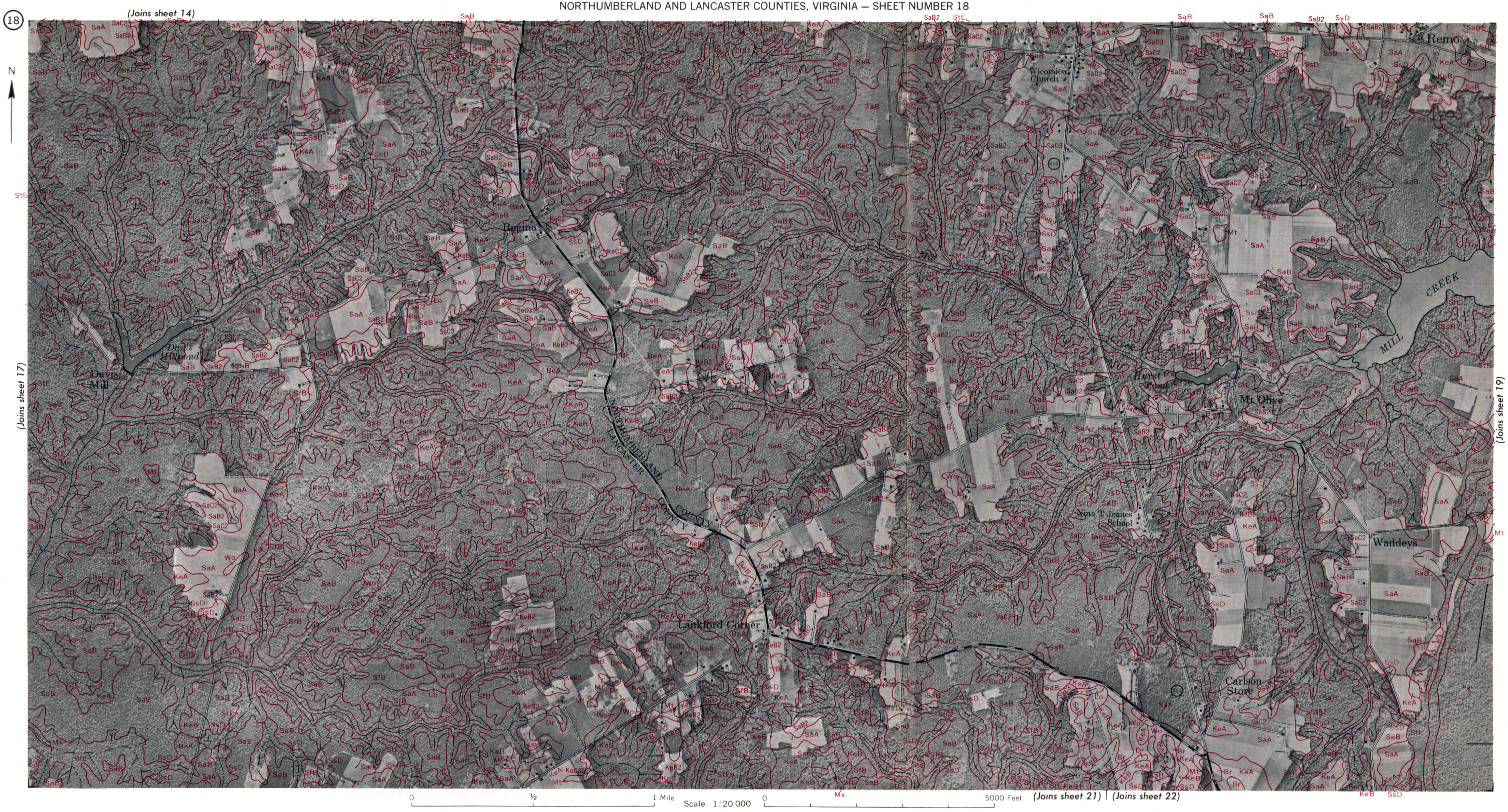
0 5000 Feet

NORTHUMBERLAND AND LANCASTER COUNTIES, VIRGINIA — SHEET NUMBER 17



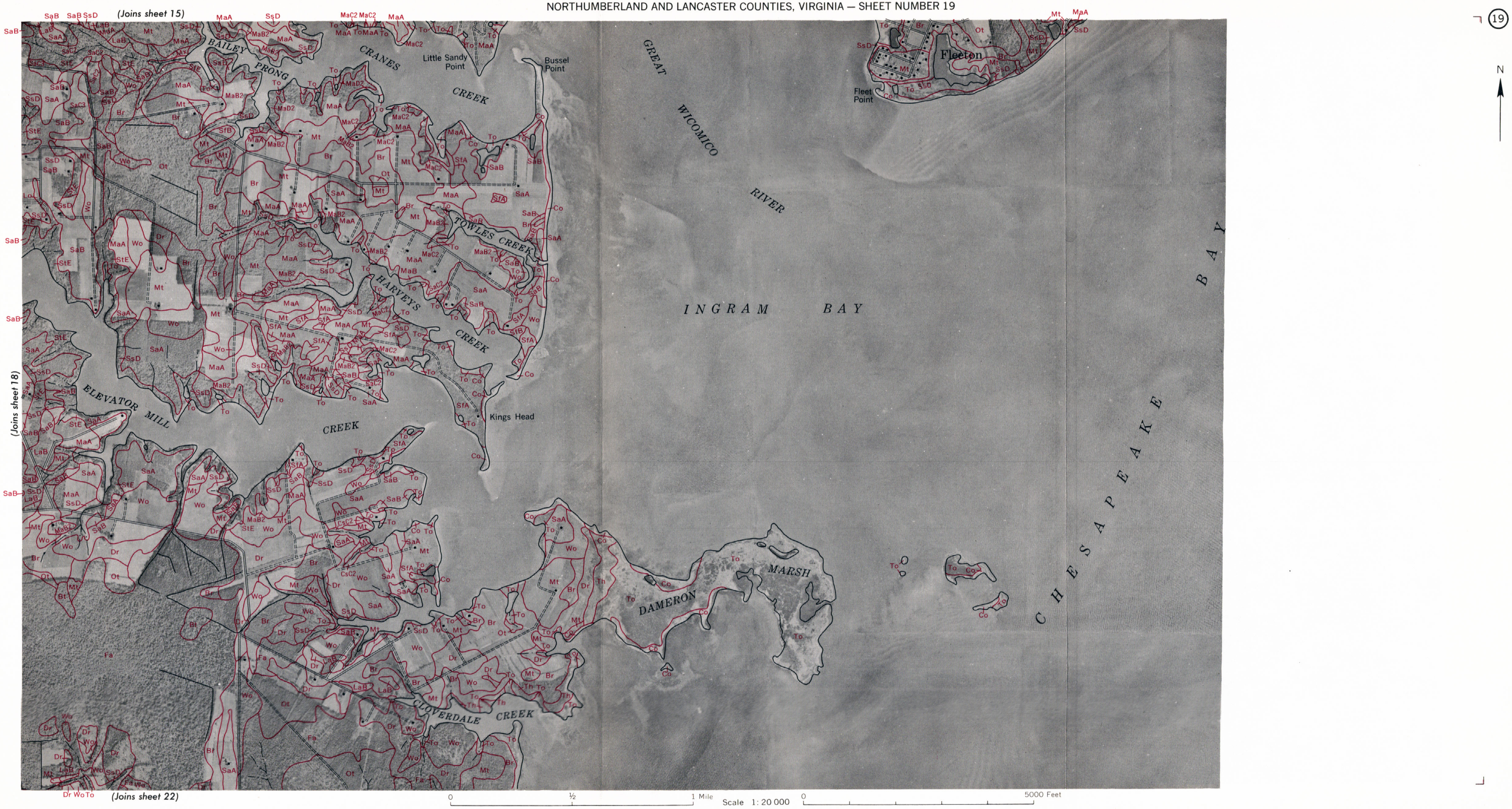
This is one of a set of maps prepared by the Soil Conservation Service, U. S. Department of Agriculture, for a soil survey report of this area. For information regarding the complete soil survey report, write the Soil Conservation Service, U. S. Department of Agriculture, Washington 25, D. C. This map compiled from aerial photographs flown in 1953.

NORTHUMBERLAND AND LANCASTER COUNTIES, VIRGINIA — SHEET NUMBER 18

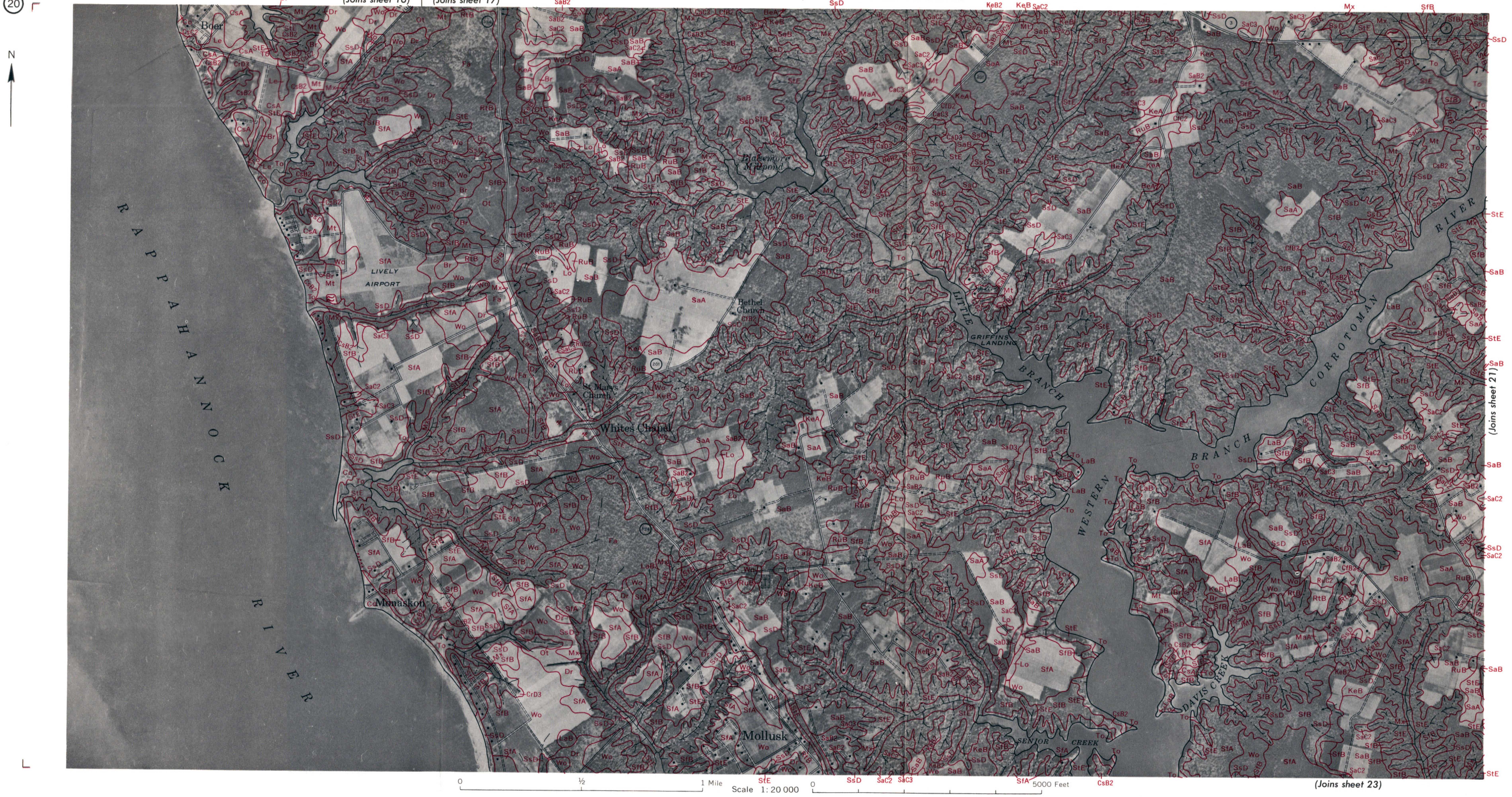


NORTHUMBERLAND AND LANCASTER COUNTIES, VIRGINIA — SHEET NUMBER 19

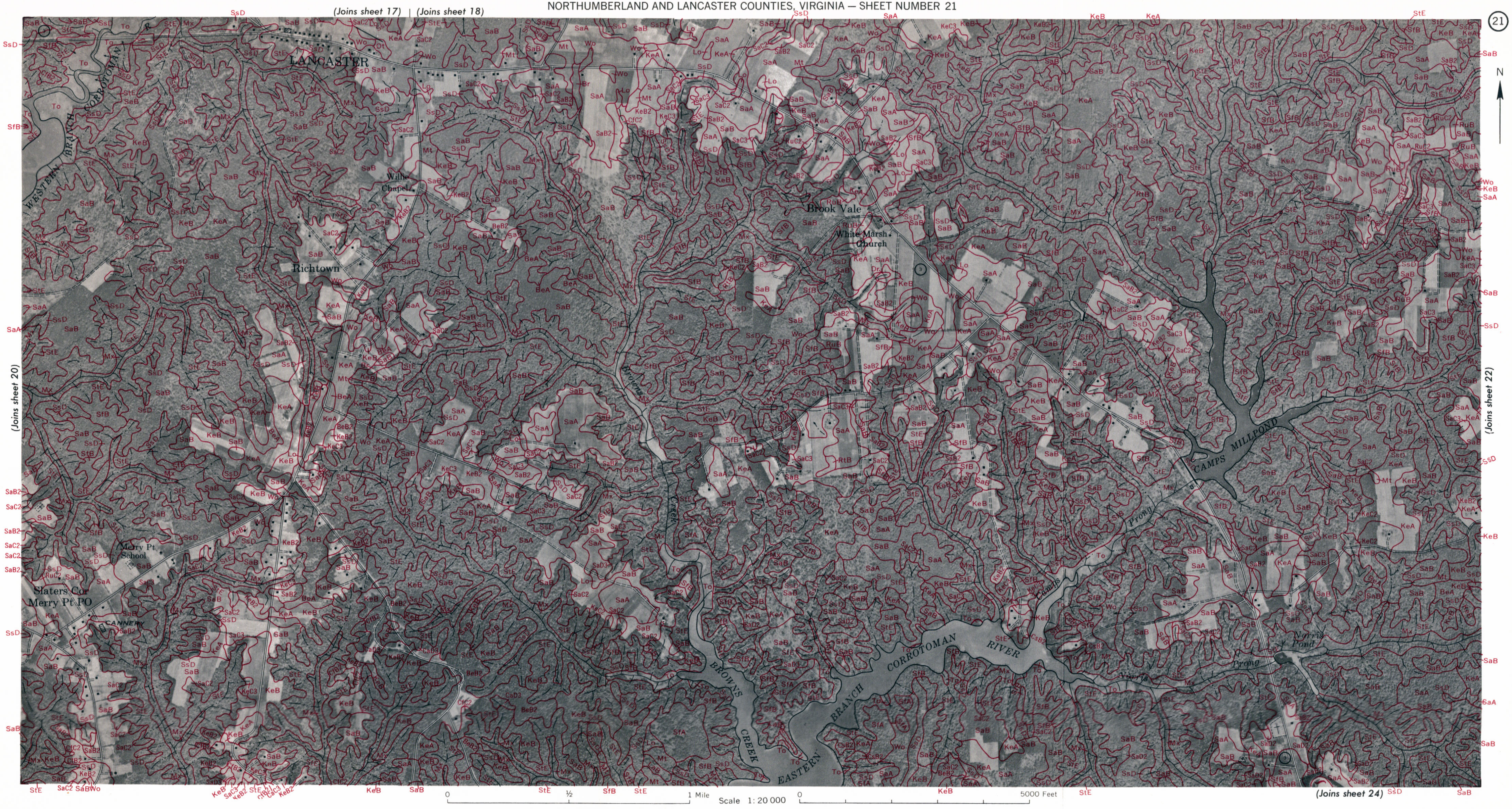
This is one of a set of maps prepared by the Soil Conservation Service, U. S. Department of Agriculture, for a soil survey report of this area. For information regarding the complete soil survey report, write the Soil Conservation Service, U. S. Department of Agriculture, Washington 25, D. C. This map compiled from aerial photographs flown in 1953.



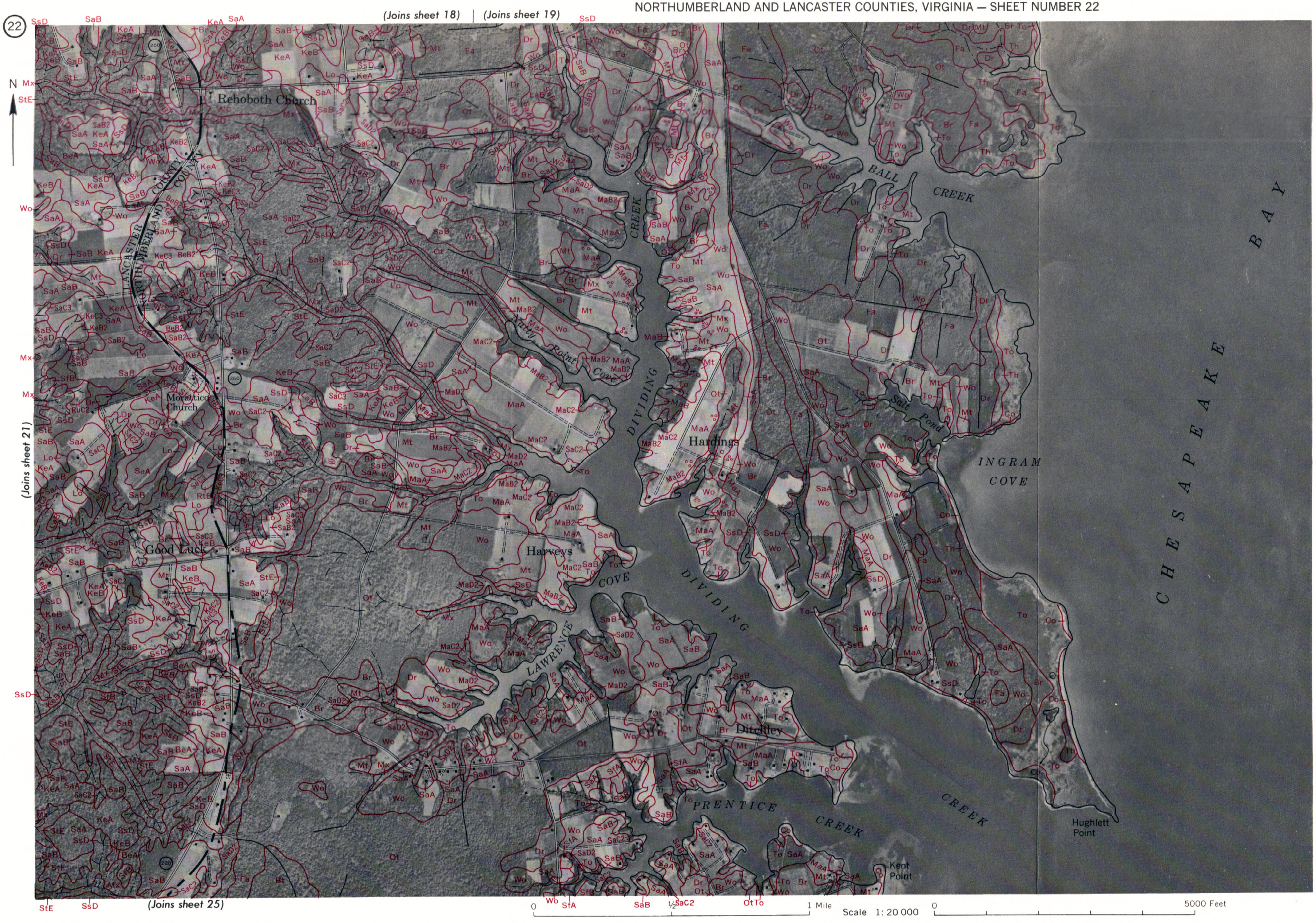
NORTHUMBERLAND AND LANCASTER COUNTIES, VIRGINIA — SHEET NUMBER 20



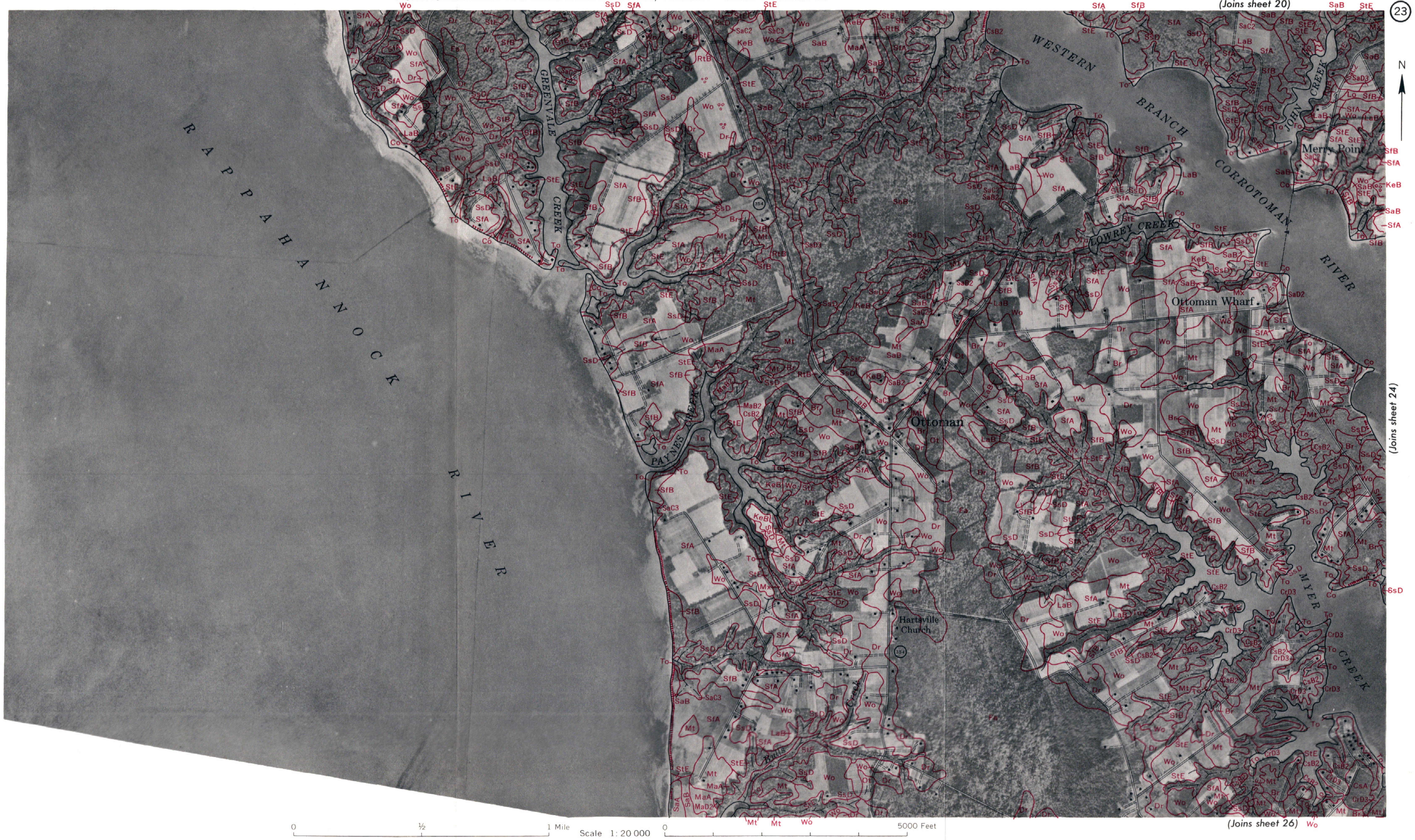
NORTHUMBERLAND AND LANCASTER COUNTIES, VIRGINIA — SHEET NUMBER 21



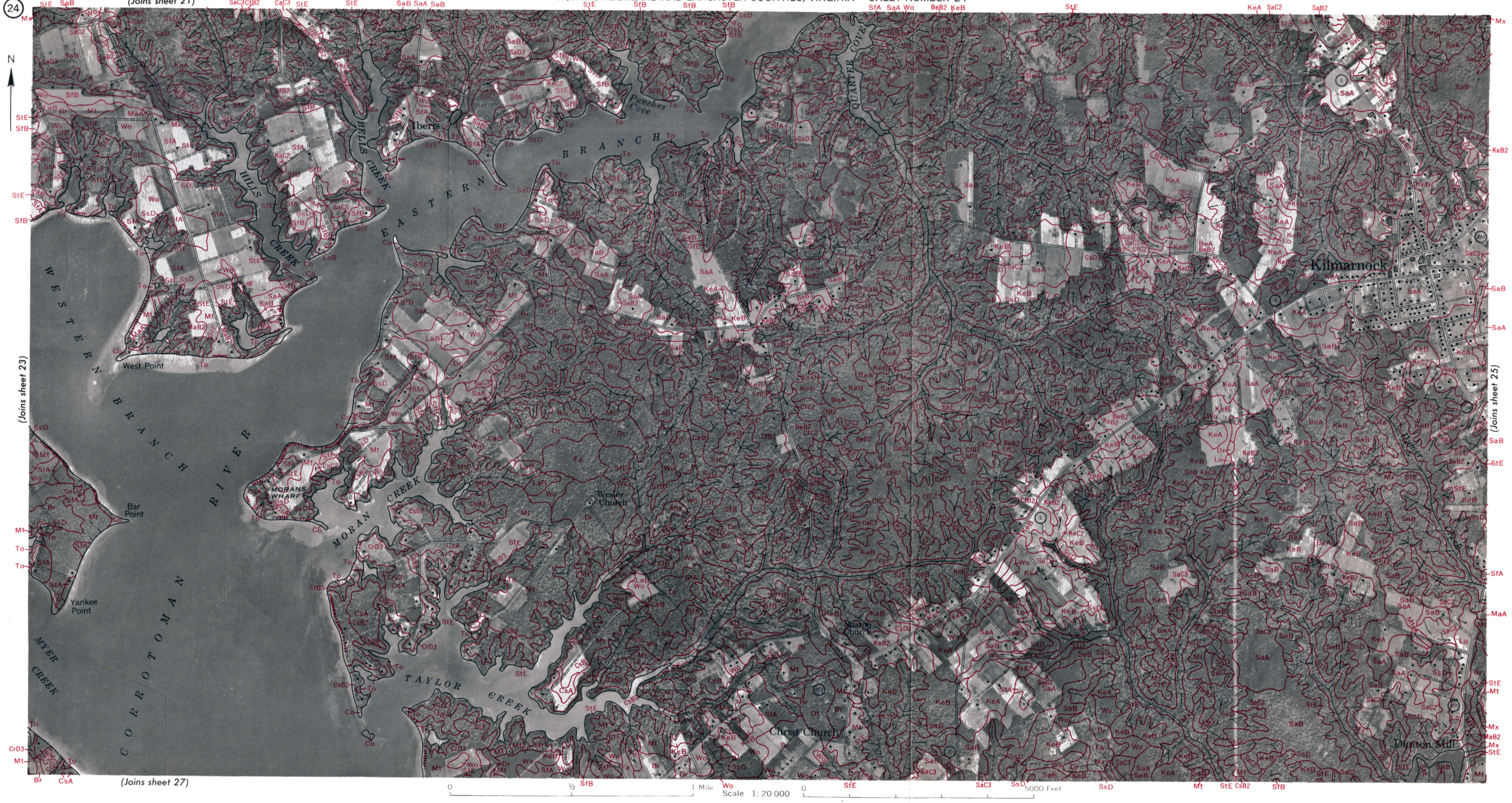
This is one of a set of maps prepared by the Soil Conservation Service, U. S. Department of Agriculture, for a soil survey report of this area. For information regarding the complete soil survey report, write the Soil Conservation Service, U. S. Department of Agriculture, Washington 25, D. C. This map compiled from aerial photographs flown in 1953.


22
(Joins sheet 18)
(Joins sheet 19)
(Joins sheet 21)
(Joins sheet 25)
N
Rehoboth Church
LANCASTER COUNTY
NORTHUMBERLAND COUNTY
Morattico Church
Good Luck
Harveys
Hardings
Ditchley
Kent Point
Hughlett Point
DIVIDING CREEK
Jarvis Point Cove
DIVIDING CREEK
COVE
LAWRENCE
BALL CREEK
Salt Pond
INGRAM COVE
CHESAPEAKE BAY
PRENTICE CREEK
200
0
½
1 Mile
Scale 1: 20 000
0
5000 Feet

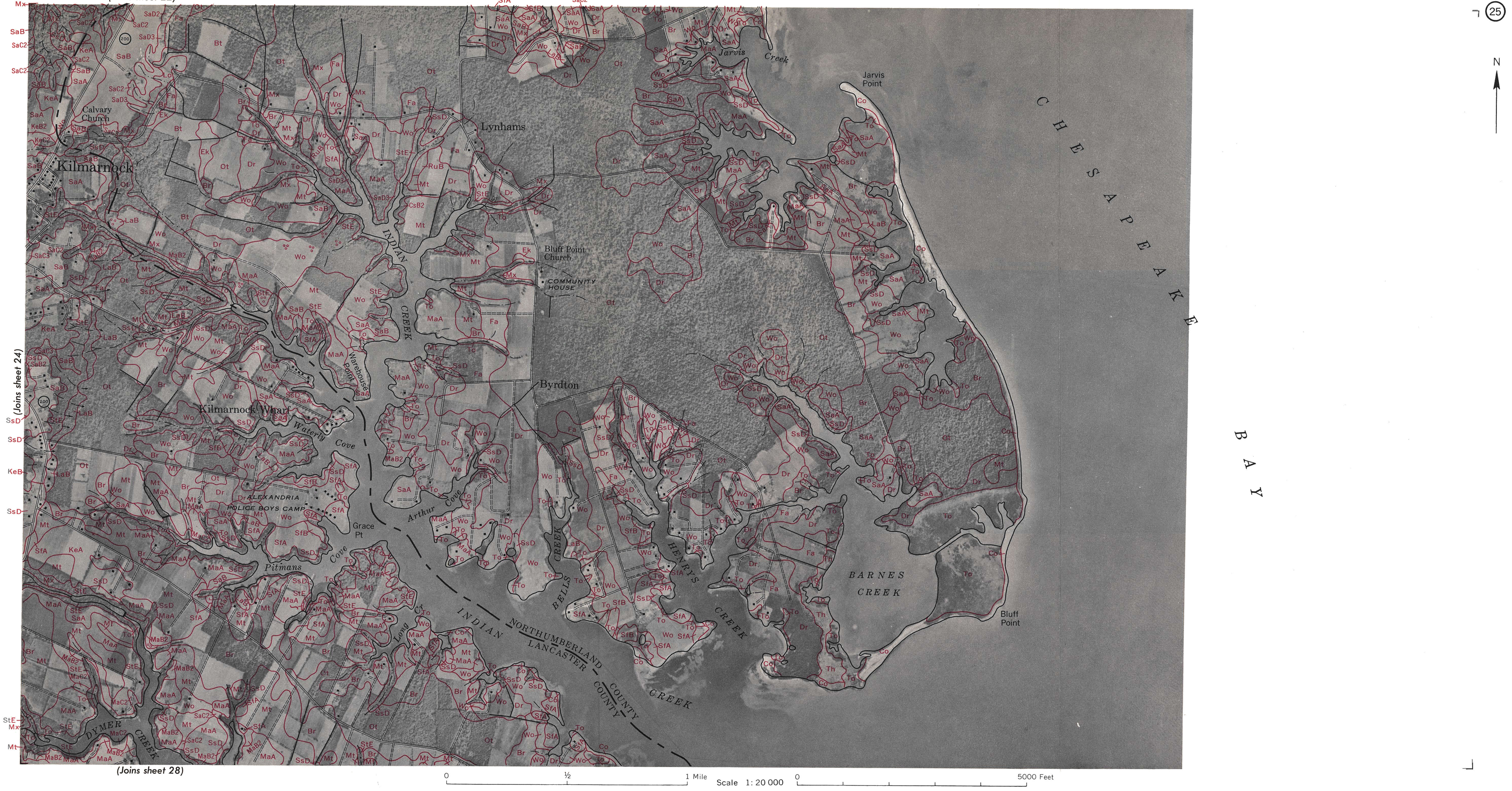
This is one of a set of maps prepared by the Soil Conservation Service, U. S. Department of Agriculture, for a soil survey report of this area. For information regarding the complete soil survey report, write the Soil Conservation Service, U. S. Department of Agriculture, Washington 25, D. C. This map compiled from aerial photographs flown in 1953.



NORTHUMBERLAND AND LANCASTER COUNTIES, VIRGINIA — SHEET NUMBER 24

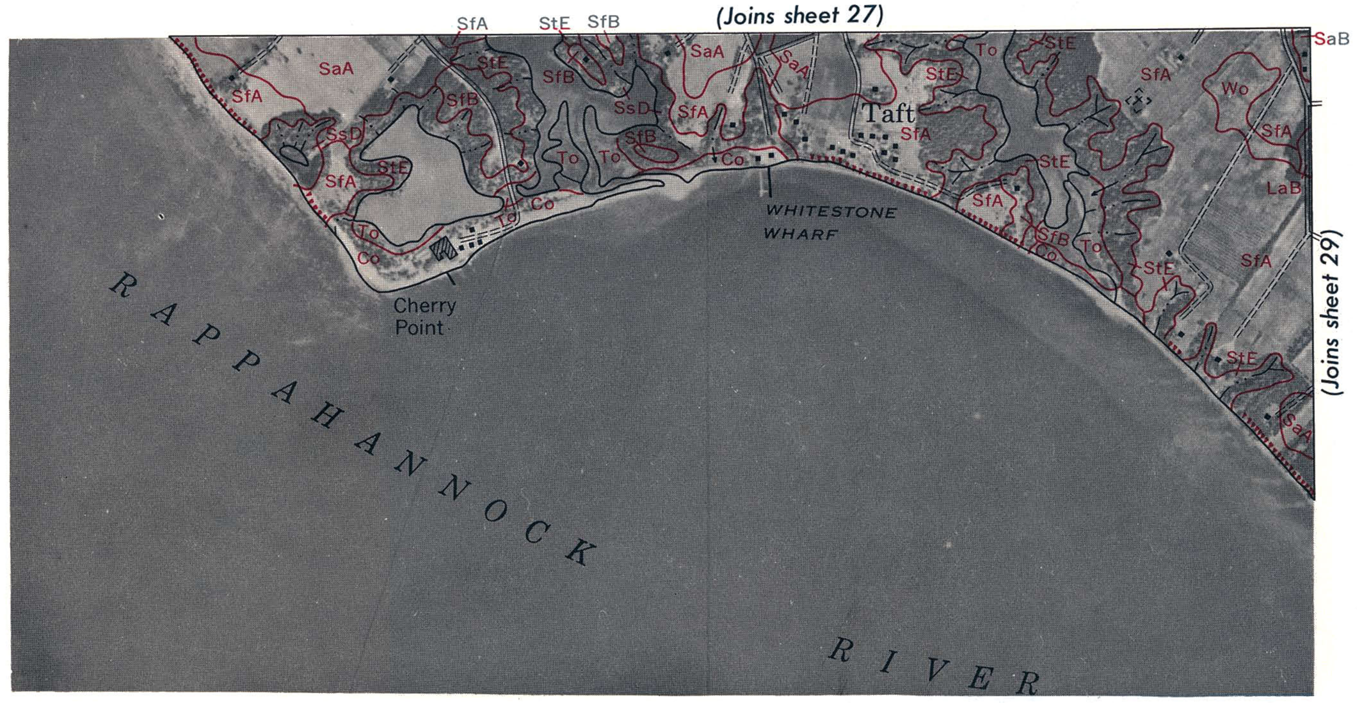


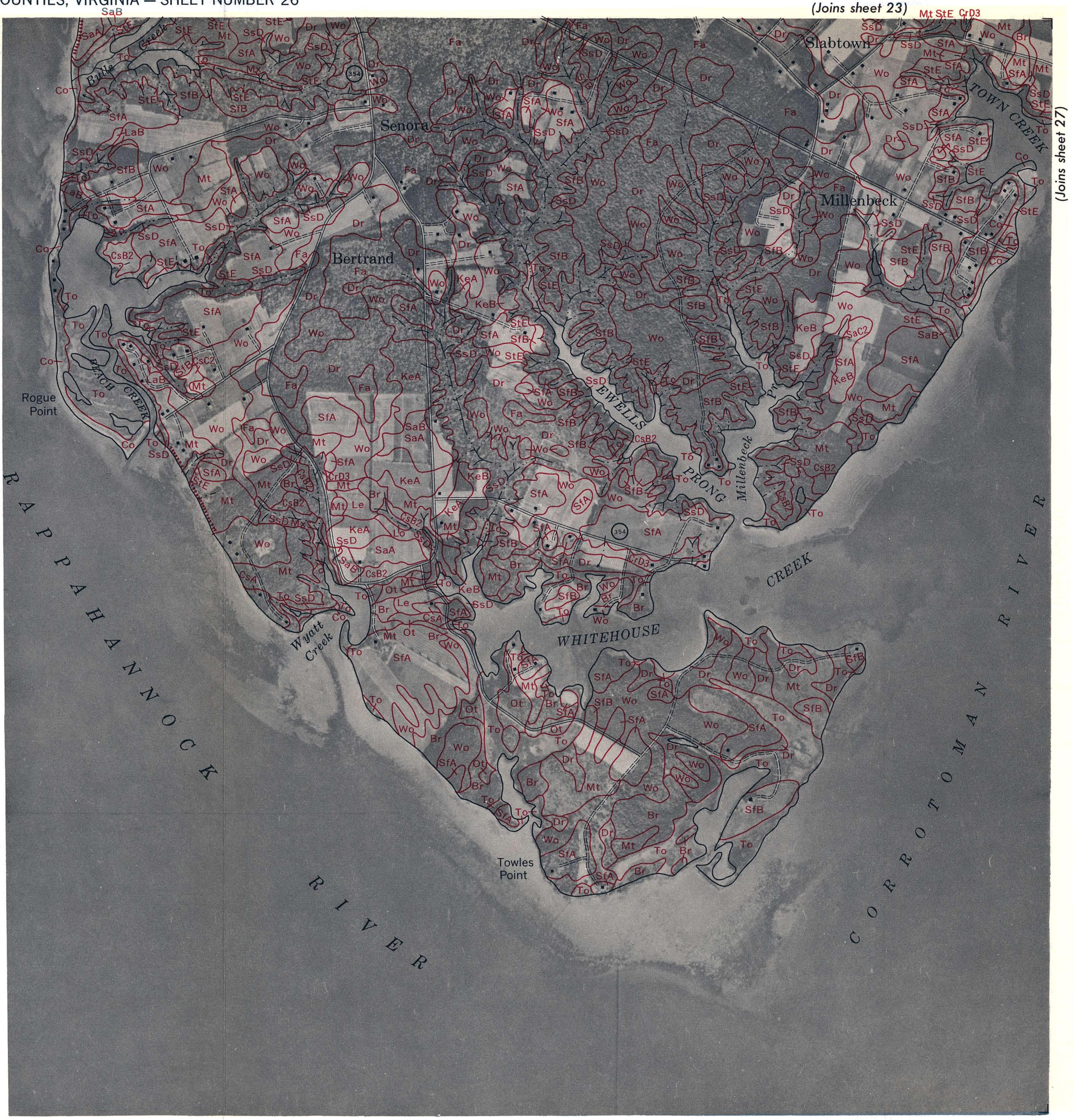
NORTHUMBERLAND AND LANCASTER COUNTIES, VIRGINIA — SHEET NUMBER 25



NORTHUMBERLAND AND LANCASTER COUNTIES, VIRGINIA — SHEET NUMBER 26

N





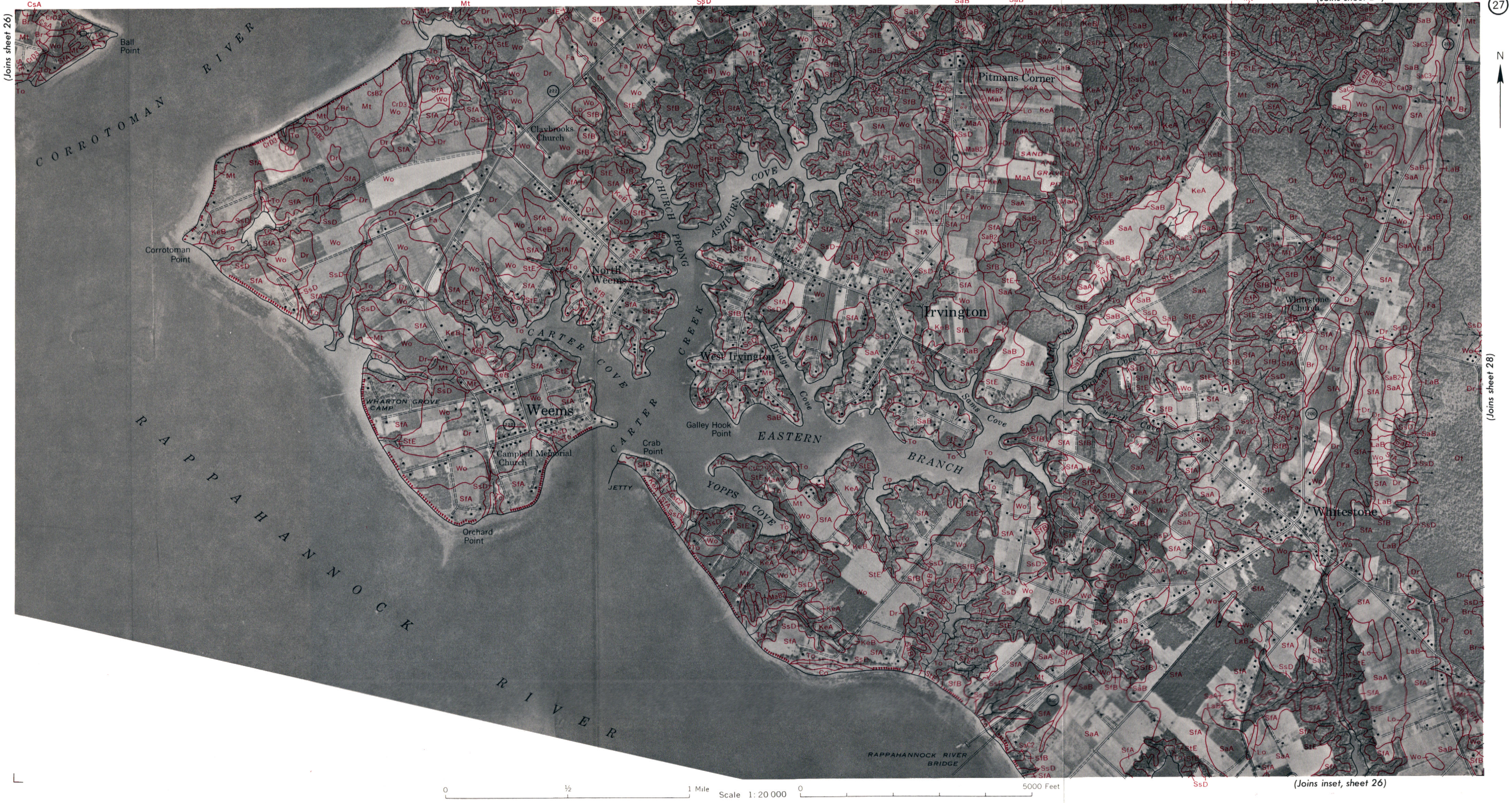
0 ½ 1 Mile

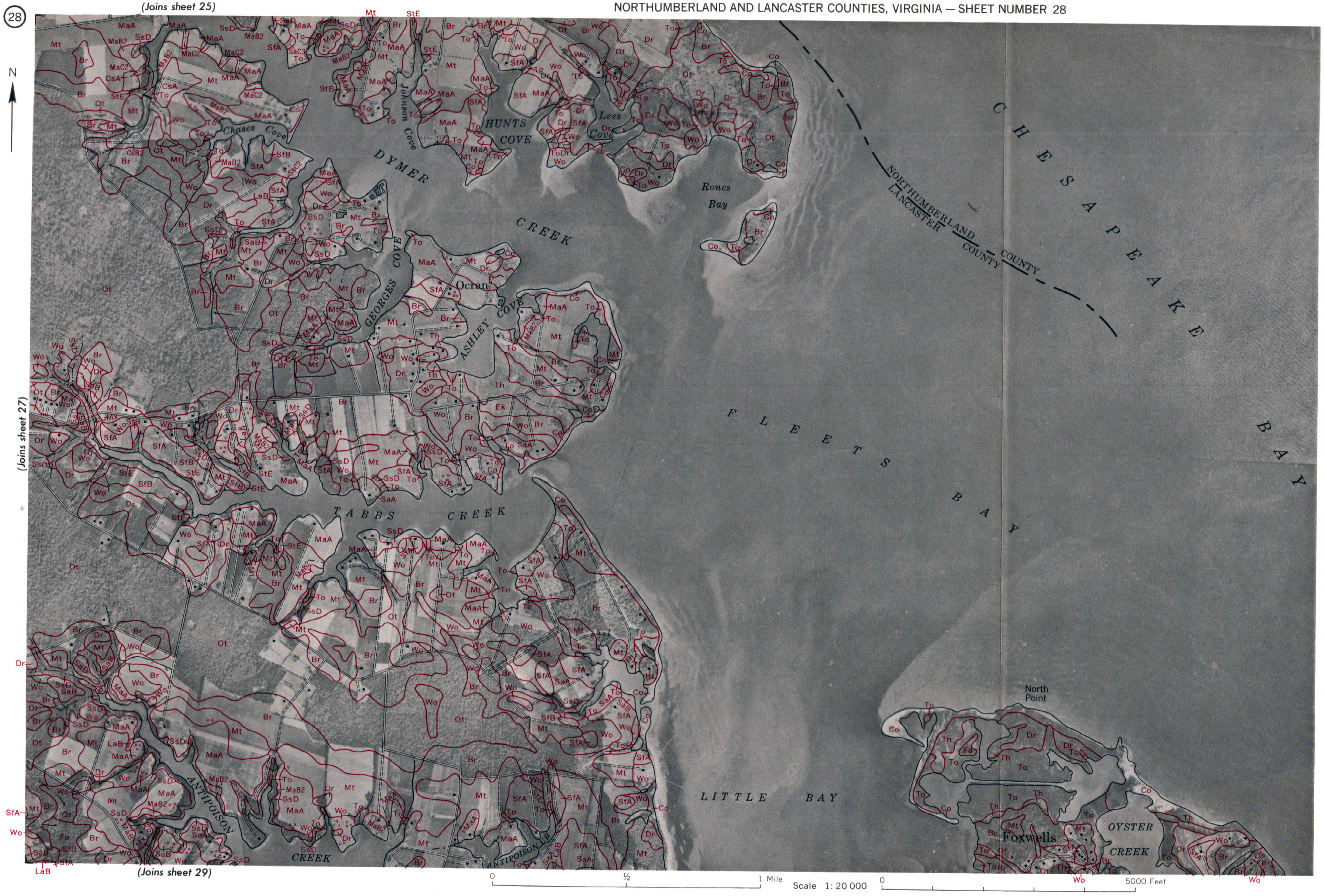
Scale 1: 20 000

0 5000 Feet

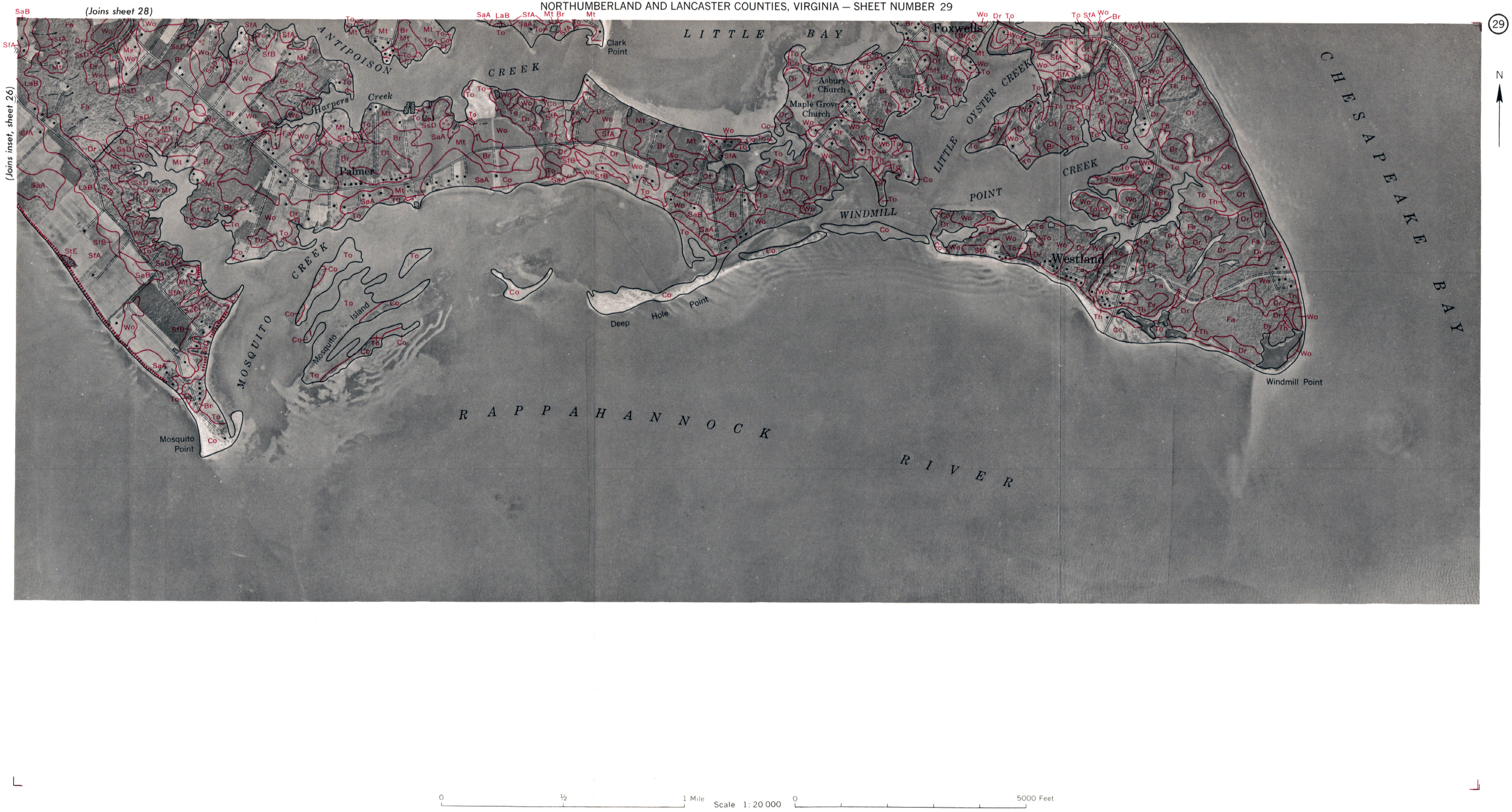
NORTHUMBERLAND AND LANCASTER COUNTIES, VIRGINIA — SHEET NUMBER 27

This is one of a set of maps prepared by the Soil Conservation Service, U. S. Department of Agriculture, for a soil survey report of this area. For information regarding the complete soil survey report, write the Soil Conservation Service, U. S. Department of Agriculture, Washington 25, D. C. This map compiled from aerial photographs flown in 1953.




28
(Joins sheet 25)
N
(Joins sheet 27)
(Joins sheet 29)
Chases Cove
Johnson Cove
HUNTS COVE
Lees Cove
DYMER CREEK
Rones Bay
CHESAPEAKE BAY
NORTHUMBERLAND COUNTY
LANCASTER COUNTY
GEORGES COVE
Ocran
ASHLEY COVE
FLEETS BAY
TABBS CREEK
ANTIPOISON CREEK
ANTIPOISON CR.
LITTLE BAY
North Point
Foxwells
OYSTER CREEK
0
½
1 Mile
Scale 1: 20 000
0
5000 Feet

NORTHUMBERLAND AND LANCASTER COUNTIES, VIRGINIA — SHEET NUMBER 29



This is one of a set of maps prepared by the Soil Conservation Service, U. S. Department of Agriculture, for a soil survey report of this area. For information regarding the complete soil survey report, write the Soil Conservation Service, U. S. Department of Agriculture, Washington 25, D. C. This map compiled from aerial photographs flown in 1953.